1954
es

ELECTRICAL REVIEW

FERRANTI

CAPACITOR CONTROL RELAY
(TYPE WR)
FOR SINGLE-STAGE CONTROL

PUBLIC LIBRARY
AUG 23 1954
DETROIT

This relay provides automatic power factor correction when used with suitable capacitors.

- Independently adjustable 'lead' and 'lag' settings over a wide range.
- Self-contained auxiliary element with substantial contacts to operate the heavy duty capacitor contactor.
- Selector switch to give automatic or manual control as required.

FERRANTI

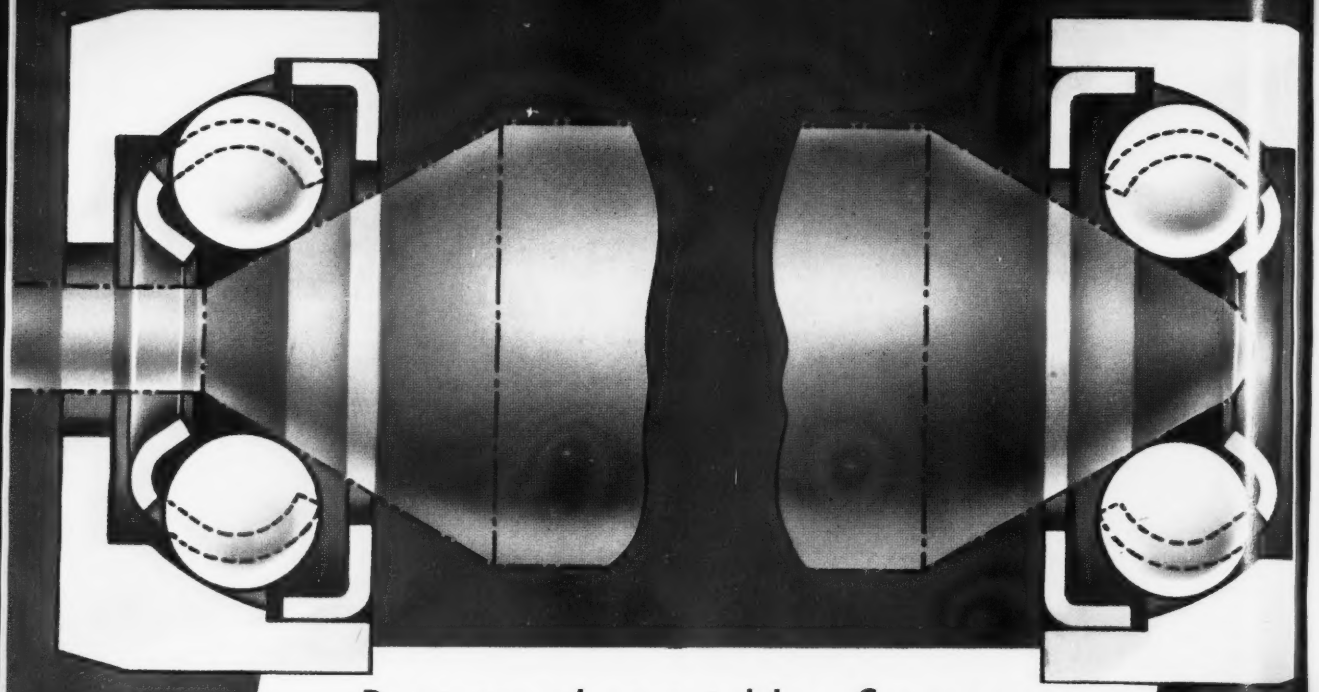
Fl. 1378

FERRANTI LTD · MOSTON · MANCHESTER 10
London Office: KERN HOUSE, 36 KINGSWAY, W.C.2.

FERRANTI ELECTRIC CLOCKS

ALWAYS RIGHT ON TIME

40 TIMES FULL SIZE



Register that trickle of current

Meters with bearings having appreciable static friction can miss a lot of revenue.

F.B.C. miniature ball bearings are now at the disposal of meter manufacturers in a range of sizes: they have extremely low starting and running friction.

The section above shows, enlarged 40 times, a bearing 2·5 mm. O.D. The simple straight tapers for the inner contact can be easily ground by the meter manufacturer on his own spindles, which can thus incorporate individual features needed in the instrument. The outer race has a spherical self-aligning track, so that some degree of error in the frame of the instrument is accommodated.

The sizes range from 1·5 mm. O.D. to 10 mm. O.D., and the open cup (see left above) will clear spindle extensions ranging from 0·25 to 2 mm. according to the size of bearing. Fuller particulars and sizes are available on application.

SOME BEARINGS, ACTUAL SIZE

FISCHER BEARINGS COMPANY LIMITED, WOLVERHAMPTON

Fischer Bearings Company Ltd., and Timken-Fischer Stockists Ltd., Birmingham, are both subsidiaries of British Timken Ltd.

FBC TRADE MARK

ALL-BRITISH

F.B.C. :: FISCHER

BALL AND PARALLEL-ROLLER BEARINGS

Scott

H.J.S.

OF NORTHERN IRELAND.

MOTORS & GENERATORS

MANUFACTURERS OF

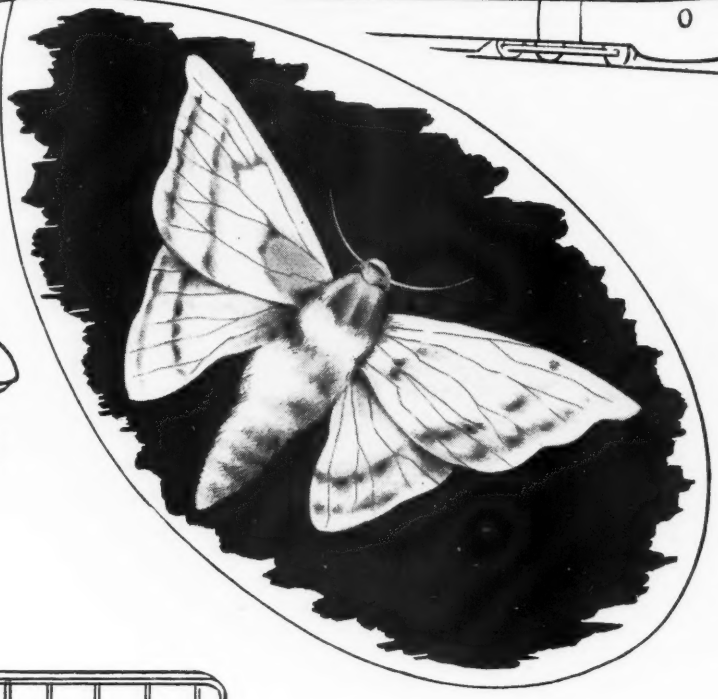
A.C. MOTORS ½-200 H.P.—D.C. MOTORS ½-200 H.P.—ALTERNATORS 1-125 KVA
GENERATORS ½-150 KW—GEARED MOTORS—MOTOR GENERATOR SETS
INVERTED ROTARY CONVERTERS

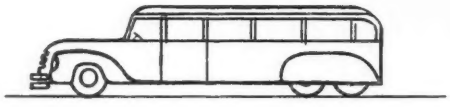
HUGH J. SCOTT & CO (BELFAST) LTD

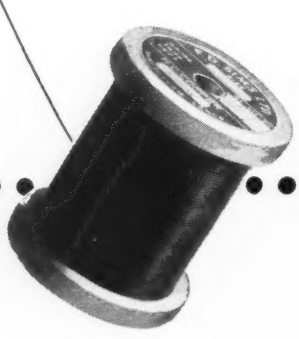
VOLT WORKS, BELFAST, N. IRELAND

PURE SILK COVERED

RONDE







PURE SILK COVERED WIRE
IS ONE OF
OUR SPECIALITIES

F.D.SIMS LIMITED

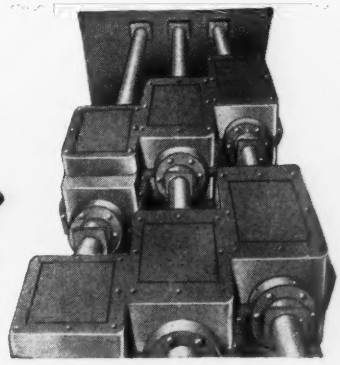
HAZELHURST WORKS - RAMSBOTTOM - LANCS

Telephone: RAMSBOTTOM 2213-4 Telegrams: "SIMS, RAMSBOTTOM"

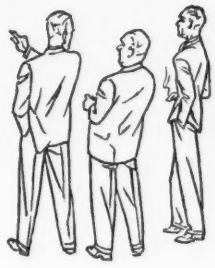
London Office: 95 WESTMORELAND ROAD, BROMLEY, KENT. Telephone: RAVensbourne 2805

S.28

Pathways to Power...



Arrangement and connections of the condenser type busbars.



What are the essential requirements of Main or Substation Switchgear?

These may be numerous and not easy to designate in order of importance, but after thorough tests to ensure the all-important feature of RELIABILITY of all components under service conditions have been satisfactorily carried out, the advantage of ACCESSIBILITY to provide EASY MAINTENANCE is one to which "Ferguson Pailin" have given the closest attention in the design of the VLP 9 unit.

TYPE
VLP 9

A switch unit or switchboard of extremely CLEAN appearance for single or duplicate busbar installations.

RATINGS: Up to 33 kV 1000 MVA 1600 A.

Other notable features are:—

- **Provision of Current Transformers in AIR.**
- **Provision of CONDENSER Type Busbars.**
- **METAL division sheets are provided between Oil Circuit-Breaker and Cables.**
- **PHASE SEPARATED Oil Circuit-Breaker.**
- **Rapid Fault Clearance.**

Ferguson Pailin LIMITED *for Switchgear*

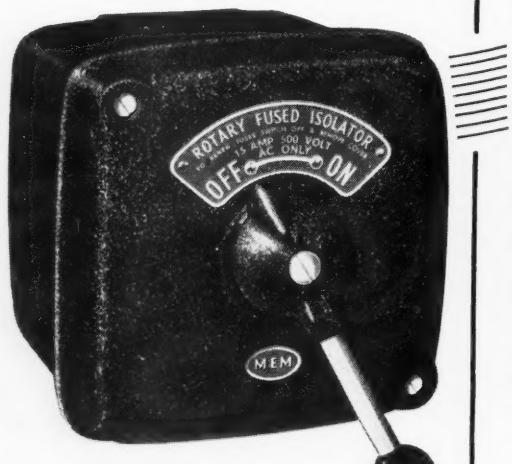
Member of the A.E.I. Group of Companies

Head Office & Works: **HR. OPENSHAW MANCHESTER 11,** *Telephone :* DROylsden 1301 (Pte.Branch Ex.)
LONDON OFFICE : Bush House, Aldwych, W.C.2 BIRMINGHAM OFFICE : Windsor House, 656 Chester Road, Erdington, 23 GLASGOW OFFICE : Central Chambers, 109 Hope Street, C.2.
REPRESENTED IN PRINCIPAL OVERSEAS TERRITORIES

MEM SWITCHCRAFT TAKES A NEW TURN

WITH THE NEW **ROTARY FUSED ISOLATOR**

FOR MACHINE TOOLS AND LIKE APPLICATIONS



The surface mounting pattern has conduit knockouts at top and bottom.

Rated at 15 amps. 500 volts, triple pole for use with A.C. motors up to 7½ H.P. max.

It's a tip-top job from start to finish, worthy in every way to be associated with machine tools and similar equipment of the most refined quality. Compact, yet extremely robust, it has all these plus points of design. And remember only M E M resources can offer such quality at prices so competitive.

- The switch is capable of disconnecting a stalled motor of 7½ H.P. taking 6-8 times full load current.
- The moving and fixed contacts are of solid pure silver, thus ensuring long life.
- KANTARK MAJOR rewirable or H.R.C. cartridge fuses are available.
- Interlocked so that cover cannot be removed until switched off.
- Completely safe for fuse renewal. All fuse contacts isolated from supply when cover removed.
- Suitable for Flush or Surface mounting applications.
- Cover fitted with gasket to prevent ingress of dust, moisture, suds, etc.
- Finished in handsome black wrinkle enamel.

Send for Folder No. 346.

MEM — Switch, fuse and motor control gear, electric fires and localised lighting equipment

MIDLAND ELECTRIC MANUFACTURING CO. LTD.
Tyseley, Birmingham 11 *Branches at London and Manchester*

Write for leaflet G13015

B T-H

BRITISH STANDARD DIMENSION MOTORS

British Thomson-Houston were among the first to manufacture mechanically-interchangeable motors conforming to B.S. 2083. Other makers build to this spec., but the BTH range of totally-enclosed fan-cooled squirrel-cage motors up to 20 h.p. have mechanical and electrical characteristics that are unsurpassed.

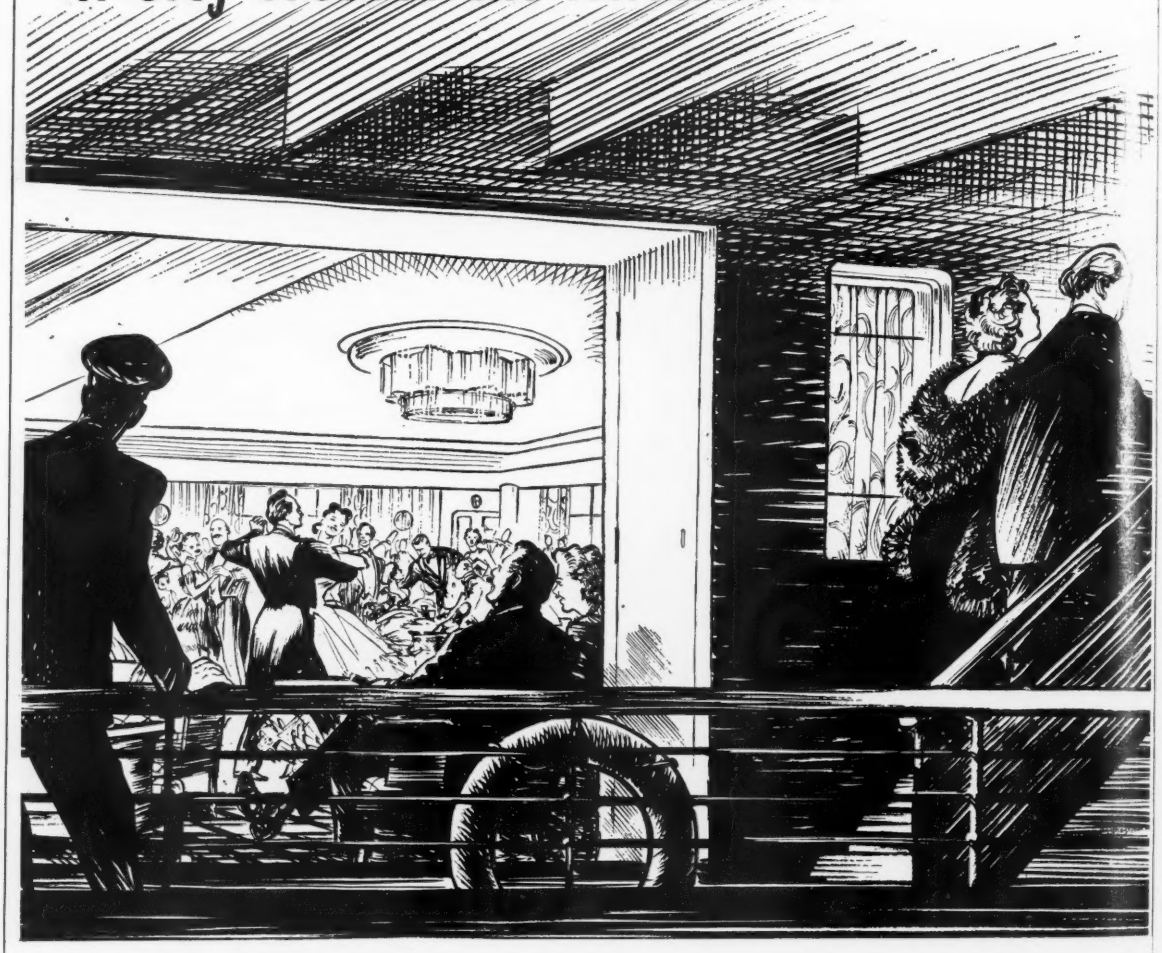
AVAILABLE FROM STOCK

THE **BRITISH THOMSON-HOUSTON** CO. LTD. · RUGBY · ENGLAND

Member of the AEI group of companies

A 4800

A city crosses the Atlantic...



The transatlantic liner employs all the resources of the electric age to make sea travel safer, more comfortable, speedier. Electric cables (over 1,000 miles of them in R.M.S. Queen Elizabeth) are the ship's arteries . . . cables developed by members of the Cable Makers Association.

By close technical collaboration among its members, the C.M.A. has pioneered the most important developments in electric cable making. That same collaboration makes possible the exceptionally high standards for all types of C.M.A. cable—and safeguards every user.

SPECIFY C·M·A CABLES

The 'Roman Warrior' and letters 'C.M.A.' are British Registered Certification Trade Marks

CABLE MAKERS ASSOCIATION, 52/54 HIGH HOLBORN, LONDON, W.C.I

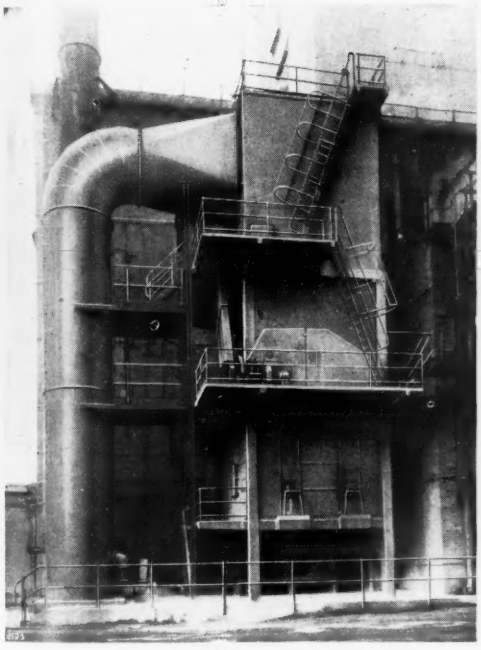
Does your manufacturing process involve

loss of valuable material in flue gases—production of dust or mist liable to damage other portions of your plant —a nuisance caused by the emission of dust or mist—the need for a completely dust-free atmosphere in certain rooms—the elimination of bacteria from an air supply ?

then you need

STURTEVANT

ELECTROSTATIC PRECIPITATION



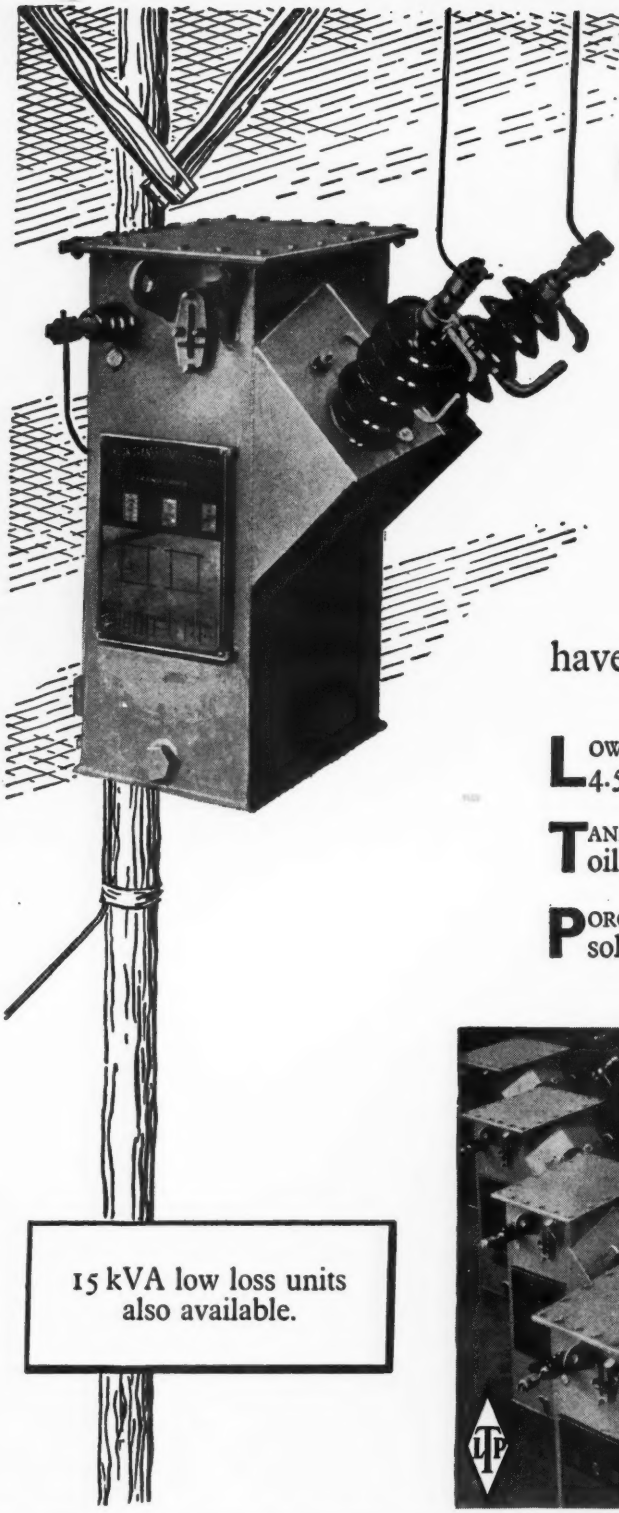
MAKE USE OF OUR
WIDE EXPERIENCE TO
INVESTIGATE SUCH PROBLEMS

PUBLICATION U.7007
GIVING DETAILS OF
STURTEVANT PRECIPITATORS
AVAILABLE ON REQUEST

The Sturtevant Electrostatic Precipitator on the left is operating after a Chemical Kiln Dryer

STURTEVANT ENGINEERING CO. LTD.

Southern House · Cannon Street · London · E.C.4



Transformers for Rural Distribution

have the following advantages –

LOW LOSSES and high overload capacities; 4.5 kVA normal rating; ratio 11,000/250V.

TANKS have single bolt fixing, domed cover, oil gauge and thermometer pocket.

PORCELAIN BUSHINGS easily replaced on site; solderless connectors and H.V. arcing horns.

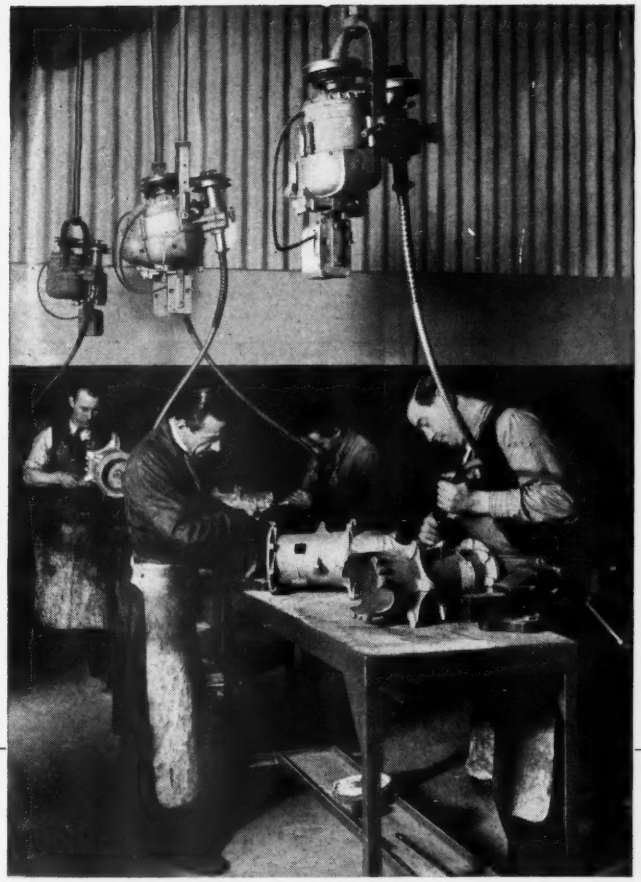
15 kVA low loss units also available.

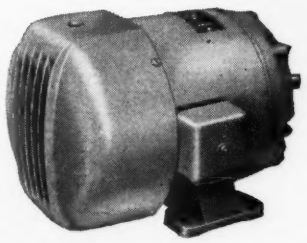
LONDON TRANSFORMER PRODUCTS LTD.

Head Office: *Telephone: Willesden 6486*
COBBOLD ESTATE, LONDON, N.W. 10.

Main Works: *Telephone: Bridgend 901*
GATE ROAD, TRADING ESTATE, BRIDGEND, GLAMORGAN.

Fractional horsepower motor applications





There is a suitable 'ENGLISH ELECTRIC' motor for every industry where a fractional drive is required.

For instance, the illustration shows 'ENGLISH ELECTRIC' standard, totally enclosed, fan-cooled motors adapted for fettling and grinding equipment.

Standard ranges include motors for single and 3-phase A.C., with split-phase or capacitor start; and D.C. types. The versatility and adaptability of 'ENGLISH ELECTRIC' fractional horse-power motors are still further increased by alternative mountings and optional extra equipment.

'ENGLISH ELECTRIC'

f.h.p. electric motors

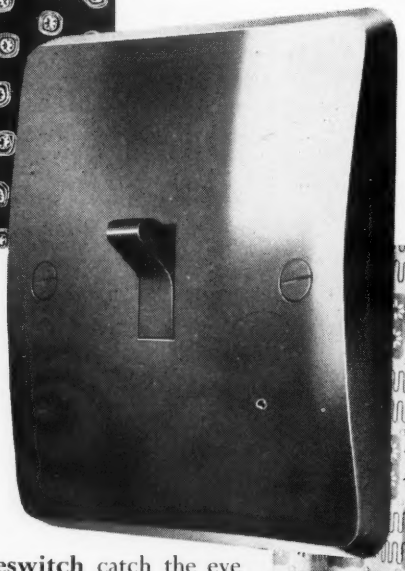
See also our Relays advertisement in this issue

THE ENGLISH ELECTRIC COMPANY LIMITED, QUEENS HOUSE, KINGSWAY, LONDON, W.C.2.
F.H.P. Motors Department, Bradford
WORKS: STAFFORD · PRESTON · RUGBY · BRADFORD · LIVERPOOL · ACCRINGTON

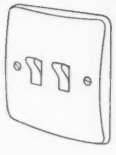
FHP, 16AC1

MK98 WHB

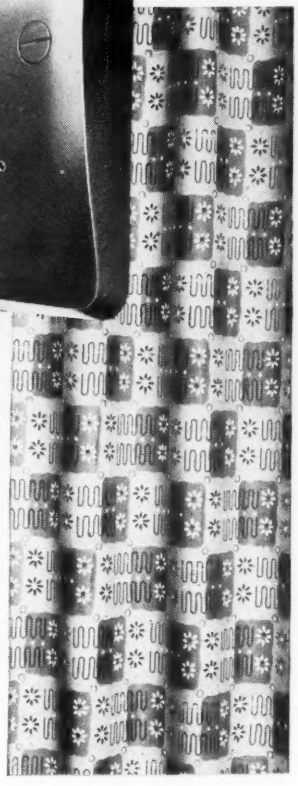
the **Plateswitch** *A distinctive new development in switch design*



the Plateswitch fits into the background of modern decoration



the compact 2-gang unit has the same dimensions as the 1-gang



The clean modern lines of the new **MK Plateswitch** catch the eye immediately. Here is a design that speaks discreetly of quality. Look at it again, and every detail of its construction and finish confirms the first impression.

Easy installation, with generous, well placed terminals; B.S. 1299 fixing centres on both one and two gang patterns; automatic levelling with the plaster; smooth, silently-controlled performance—these features combine to make the **Plateswitch** as attractive as its appearance suggests. Here, too, is a distinct price appeal. The **Plateswitch** qualifies on cost for the most competitive work. Ask for Leaflet 227 and compare the value.

THESE ADVANTAGES SIMPLIFY STOCKING

Every **Plateswitch** is supplied with four screws to match—two 4BA for metal boxes and two No. 5 wood screws for wood boxes.

The two gang **Plateswitch** has two 2-way switches only, each or both of which can be wired as 1-way.

MK REGD

. . . the mark of leadership

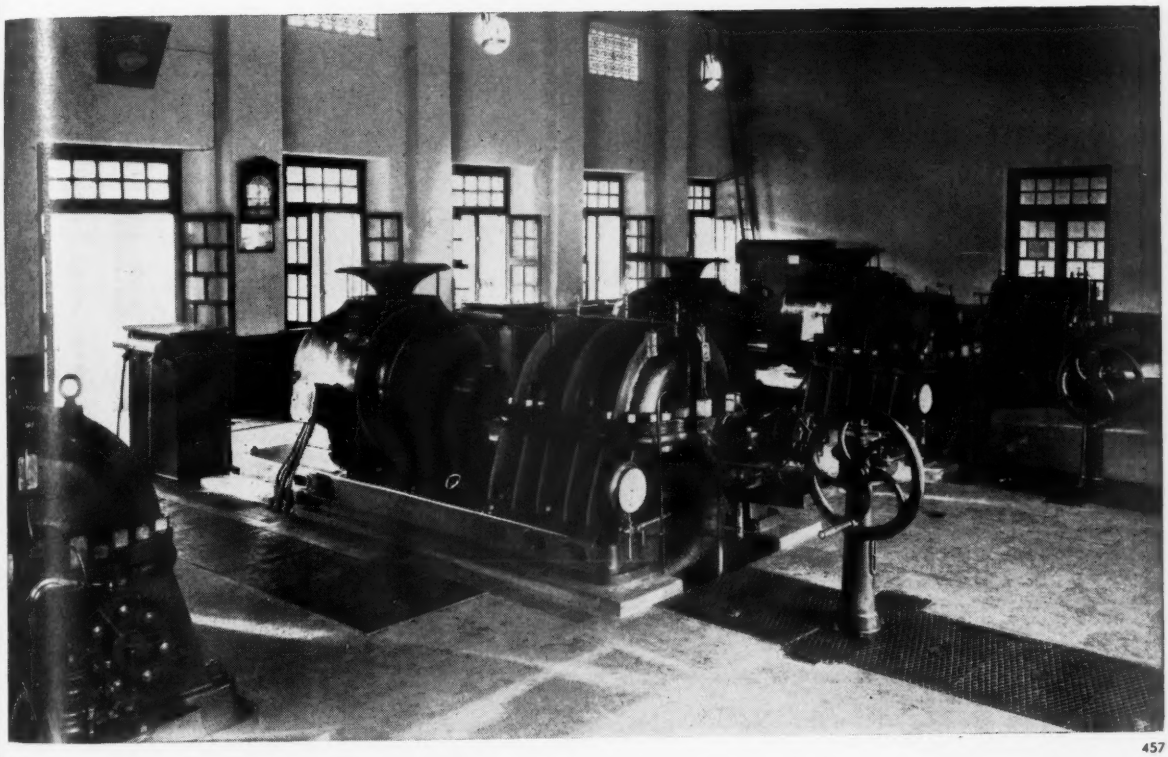
M. K. Electric Limited, Wakefield Street, Edmonton, London N.18. Edmonton 5151

1000 HP

PUMPING SETS

installed at

Thippagondanahalli



457

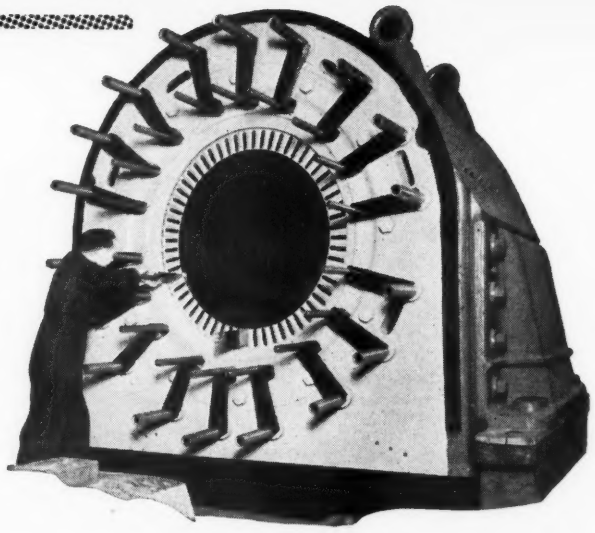
Mather & Platt Ltd. originally supplied three pumping sets for this installation for Bangalore Water Supply. Since then a repeat order of one set has been installed. The 3-stage split-casing pumps deliver 2,080 g.p.m. against 1,000 ft. head, driven at 1,485 r.p.m. by Mather & Platt 1,000 b.h.p. squirrel cage motors operating from 2,300 v. supply.

MATHER & PLATT LTD.

PARK WORKS
MANCHESTER 10

Urgent or intricate —or both?

However urgent, intricate or big the job, if it's a question of electrical repairs, contact your nearest B.E.R.L. works. Illustrated is a typical job—a complete rewind on a 16,500 kVA Alternator. The first new stator bar is just being inserted and the lower view shows this stage completed.



At your next breakdown telephone the District Manager in your area for immediate attention.

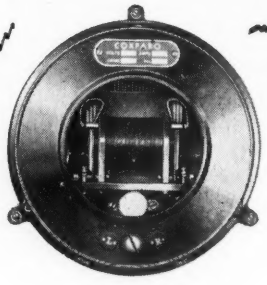
REPAIR BERL SERVICE

BRITISH ELECTRICAL REPAIRS LIMITED
EMPIRE HOUSE, CHARLOTTE ST., MANCHESTER 1

Works at: **BATH, BIRMINGHAM, CARDIFF, CHESTERFIELD, EDINBURGH, GLASGOW, HAWICK, LONDON, MANCHESTER, NEWCASTLE, SWANSEA**

dmBE2

COXPARO *automatic* REGULATOR



This Automatic Voltage Regulator is only one of our standard range.

It has been in production for many years and has been gradually improved to its present high standard.

There are many hundreds in use and are being used by many alternator and generator builders.

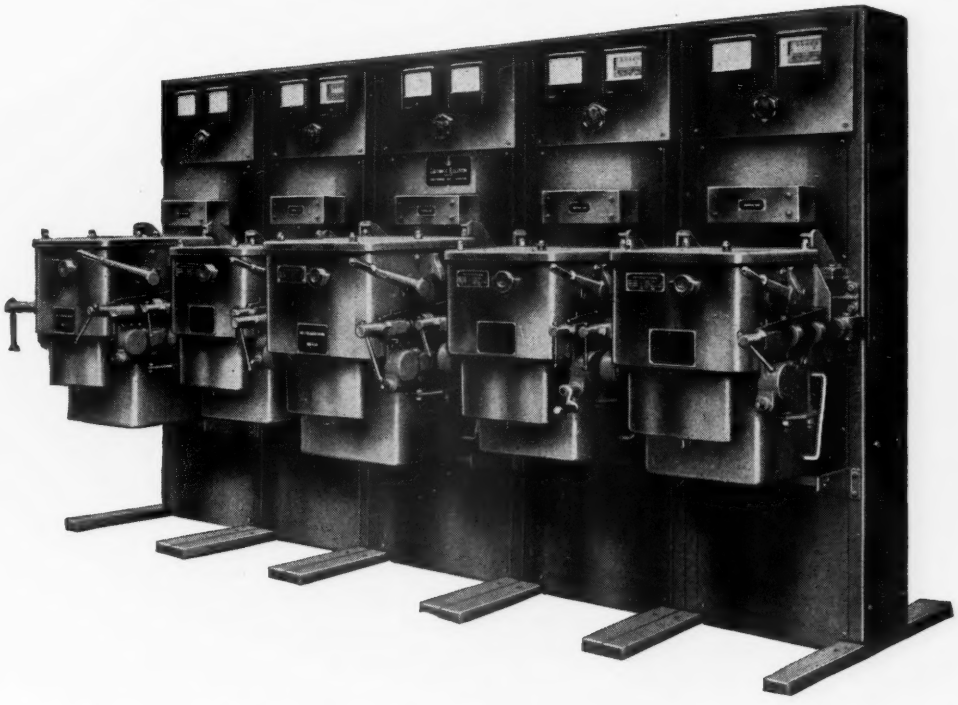
As specialists in the field we shall be pleased to advise on the question of automatic voltage regulation if we may receive particulars of your specific requirements for any loading.

- Accurate to ± 1% or less.
- Suitable for A.C. and D.C. Machines.
- Simple effective design.
- Easy and quick to install.
- Pure platinum contacts.
- Negligible maintenance.
- Extremely rapid operation.

COX-WALKERS LTD.
NORTH EASTERN ELECTRIC WORKS
Est. 1880 DARLINGTON *Phone 2387*

A.S.T.A. TESTED SWITCHGEAR

Complying with B.S. 116: 1952



"ELLISON" 660 VOLT DISTRIBUTION SWITCHBOARDS are available with tested circuit breakers in current rating sizes of up to 2400 amps and 45 M.V.A. rated breaking capacity. They are designed for easy and safe maintenance and flush mounted instruments add to the clean appearance.

YOU CAN RELY ON AN ELLISON **PRODUCT**

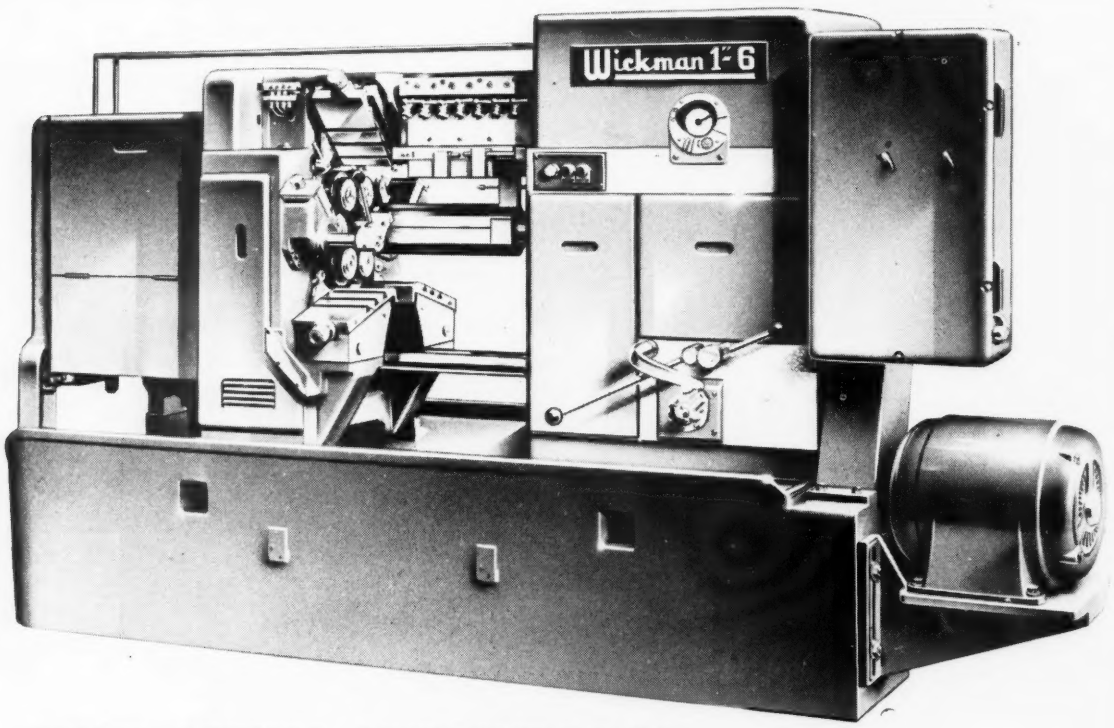
Regd. Trade Mark

GEORGE ELLISON
LIMITED
BIRMINGHAM ENGLAND

727

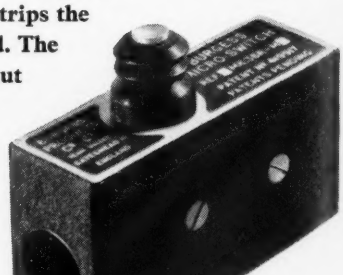
BURGESS MICRO-SWITCHES

— Industry's Automatic Choice —



THE NEW WICKMAN 1" 6-SPINDLE AUTOMATIC

This recent addition to the famous Wickman range of Automatics employs three Burgess Micro-Switches. One energises a solenoid which trips the feed when the feed safety clutch disengages as a result of overload. The other two disengage the bar feed clutch when any spindle runs out of bar stock. All three Micro-Switches are our robust metal-clad type, reference MK.3BR-MS, provided with conduit entry.



Burgess Micro-Switches provide the reliable and accurate answer to so many automatic switching problems, as Wickman Ltd. have discovered. If you have such a problem, why not consult our engineers ? Catalogue No. 50/7 contains details of our standard range.

BURGESS PRODUCTS COMPANY LTD.

Micro-Switch Division, Dukes Way, Team Valley, Gateshead 11. Telephone : Low Fell 75322 (3 lines).

1-80 h.p. motors by BRUSH

At Cardiff, Brush make their range of smaller motors, from 1 h.p. babies to middleweights with 80 h.p. on the shaft. If your needs come anywhere within this range they'll have the answer at Cardiff: slipring or squirrel cage, conforming to BSI, CSI or NEMA standards. And if yours is a case for a 'special', it may already be among our existing types. If not, we shall be pleased to consider your particular requirements. Write for full details and Publication No. 11002.

BRUSH ELECTRICAL ENGINEERING CO. LTD., HOPKINSON WORKS, CARDIFF

Telephone: Rhiwbina 1691

BIRMINGHAM · BRISTOL · GLASGOW · IPSWICH · LEEDS · LONDON · LOUGHBOROUGH · MANCHESTER · NEWCASTLE · SHEFFIELD B.39

No. 4 of a Series

Units Produced from Sheet or Strip Metal

Complete or Sub-assemblies undertaken

There are six basic stages in producing a completed unit. Our modern factory enables the units to be processed from tooling-up, pressing, welding, sub-assembly, finishing, to final assembly and packing.

★*This is a section of our General Dept. equipped with the most up-to-date plant*

A.I.D. and A.R.B. Approved

We welcome your enquiries

ADAMS BROS. & BURNLEY LTD.

MASTERS OF METAL PRODUCTS

Elmgrove Road, Harrow, Middx. Telephone: Harrow 6411 (5 lines)

MINERVA

ELECTRICAL INSULATING VARNISHES

STOVING VARNISHES (NATURAL RESIN TYPE)

STOVING VARNISHES (SYNTHETIC RESIN TYPE)

THERMO-SETTING VARNISHES

AIR-DRYING VARNISHES

CLOTH VARNISHES

CORE-PLATE VARNISHES (STOVING AND AIR-DRYING)

COPPER-WIRE ENAMELS (OLEO-RESINOUS AND SYNTHETIC TYPES)

All the above are supplied in black and clear.

ACID AND HEAT RESISTING ENAMELS (AVAILABLE IN ALL COLOURS)

MICA BONDING VARNISHES

COIL STICKING VARNISHES

SLEEVING VARNISHES (BLACK, CLEAR AND COLOURS)

CABLE LACQUERS (NON-FLAM., CELLULOSE TYPE AND P.V.C.)

COMPOUNDS (VARIOUS TYPES)

All the materials listed conform to B.S. Specifications wherever applicable.

Our Insulating Varnish Department includes research and testing laboratories; the service of specialists is available to any manufacturer or engineer concerned with problems of insulating materials and their application.

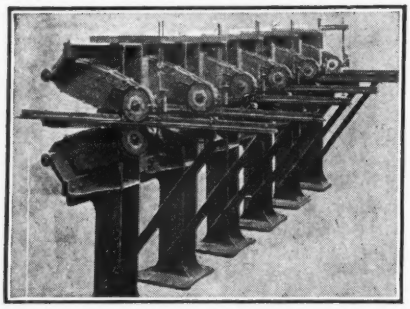
PINCHIN JOHNSON & CO.

4 CARLTON GARDENS, LONDON, S.W.1. Tel.: TRA 5600

The WESTMINSTER ENG. Co. Ltd.

VICTORIA ROAD, LONDON, N.W.10

London Telephone: Elgar 7372 (2 lines)



For removing the scale from 2 surfaces on one edge of plate simultaneously, preparatory to welding.

A batch of single-ended Pedestal Type

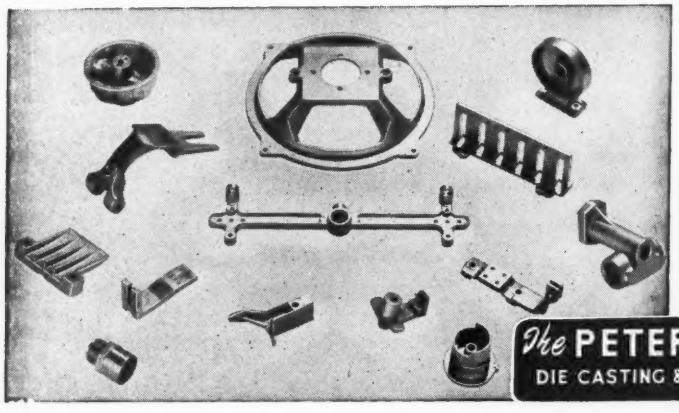
PATENT **SCALING MACHINES**

Grelco

LIMITED

MULTI-PLUG ADAPTORS

GRELCO WORKS
MINEHEAD, SOMERSET
Telephone: MINEHEAD 740



PRESSURE *Die Castings*

in aluminium and zinc alloys for the Electrical and Allied trades to **correct metallurgical standards.**

QUALITY in QUANTITY

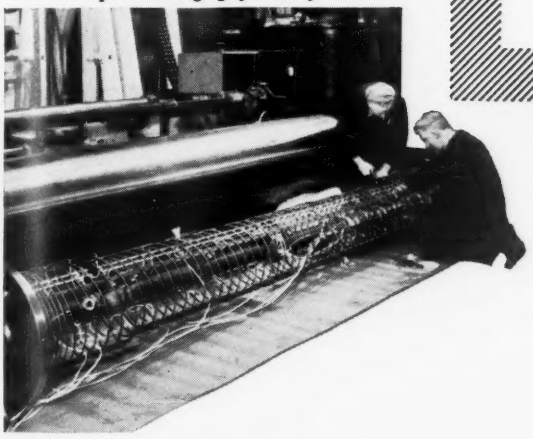
If your needs are for exacting accuracy, quality and quantity we have continuous experience of over a QUARTER CENTURY.

The **PETERBOROUGH** DIE CASTING & MACHINE CO. LTD.

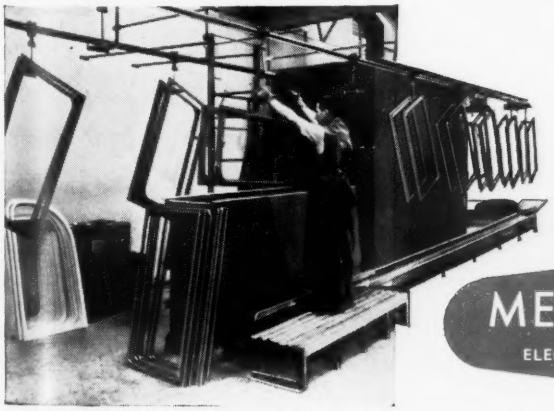
Telephone 2084
PETERBOROUGH

METROVICK FOR ALL INDUSTRIAL HEATING

Dielectric pre-heating of plastic pellets.



Tubular-element Roller Heater.



Infra-red paint stoving of window pans.

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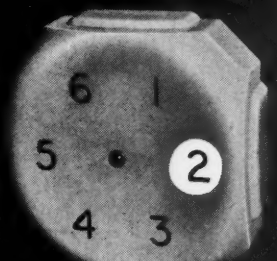

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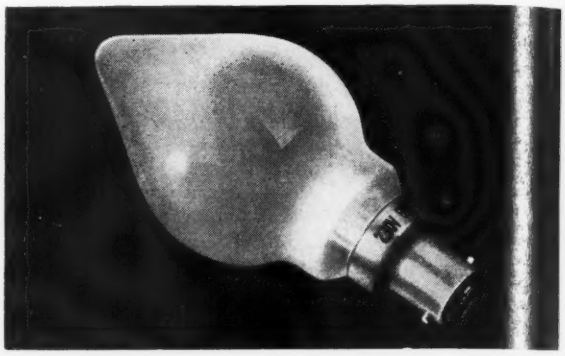

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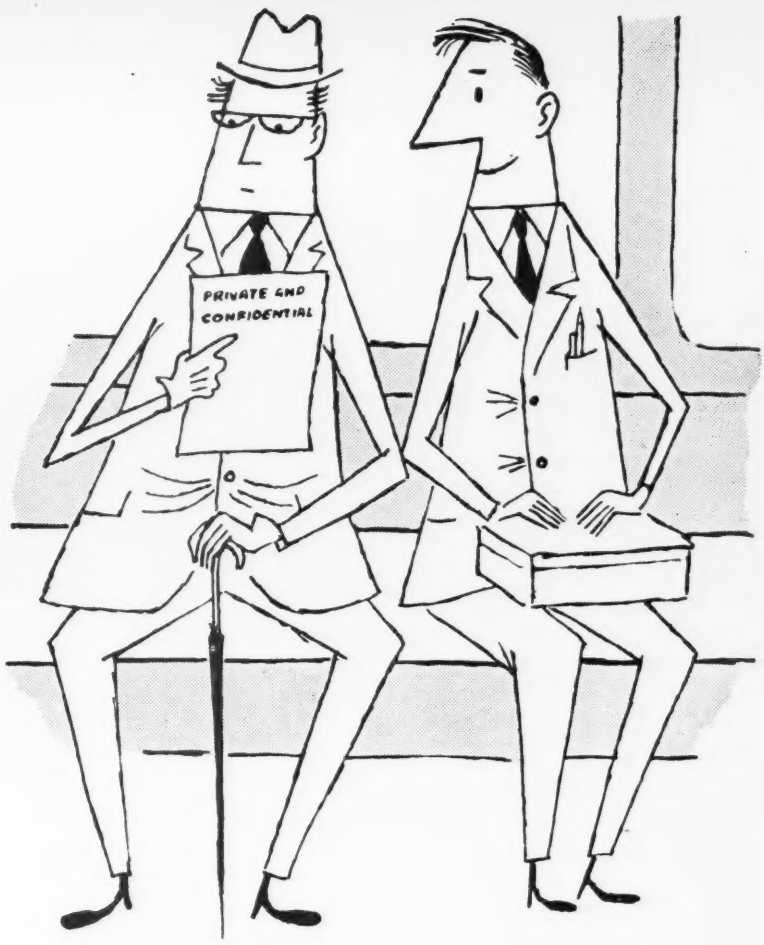

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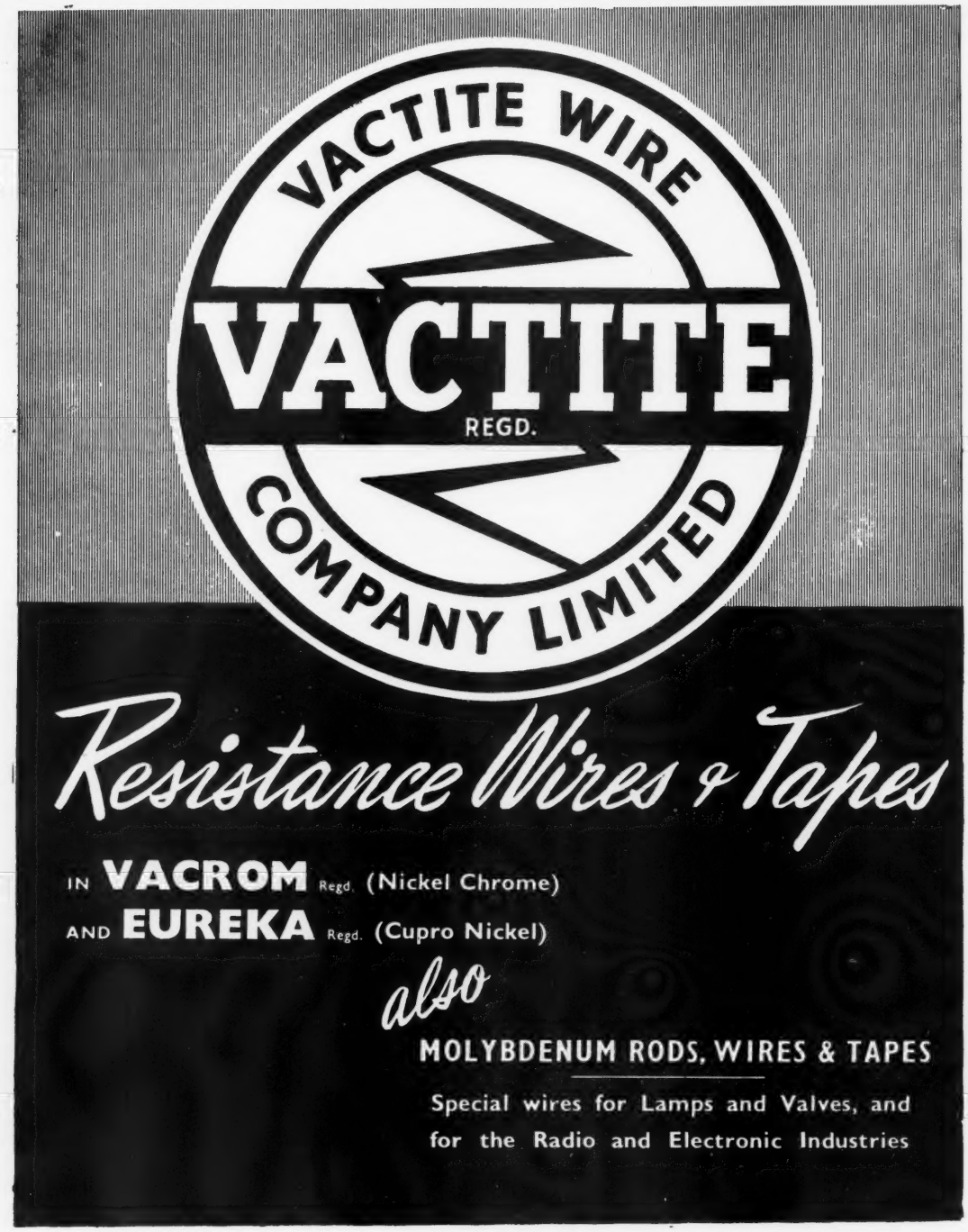

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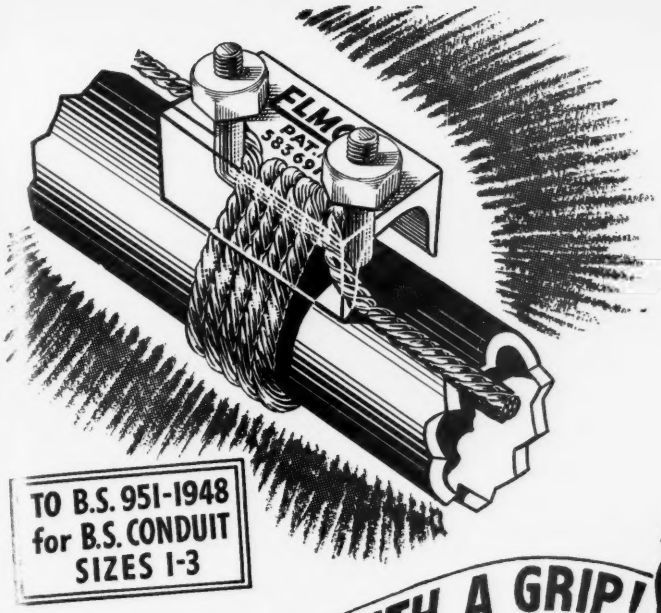

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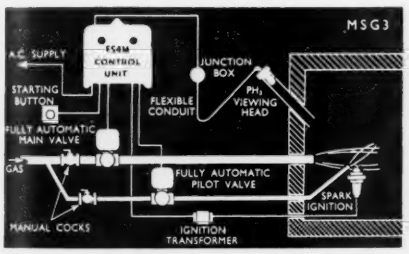
Furnace safety assured by FSM



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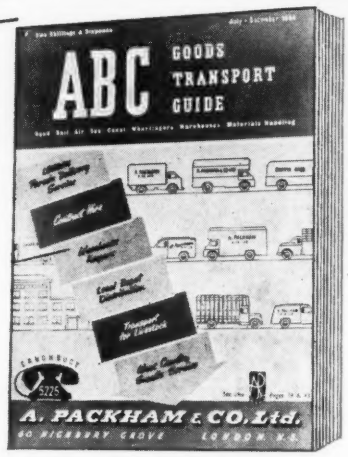
A B C GOODS TRANSPORT GUIDE

. . . . . tells you how to do it



Transport managers, despatch managers and consignors in all industries, will find this new edition of the GOODS GUIDE an invaluable aid in their work. With its help they can speedily find the nearest and quickest means of despatching loads of all sizes and kinds.

"Smalls" or bulk, local or long distance, you will have the information required for moving YOUR goods at your finger tips, with this essential book.

Half-yearly issues: July—December 1954 *and January—June* 1955

CONTENTS

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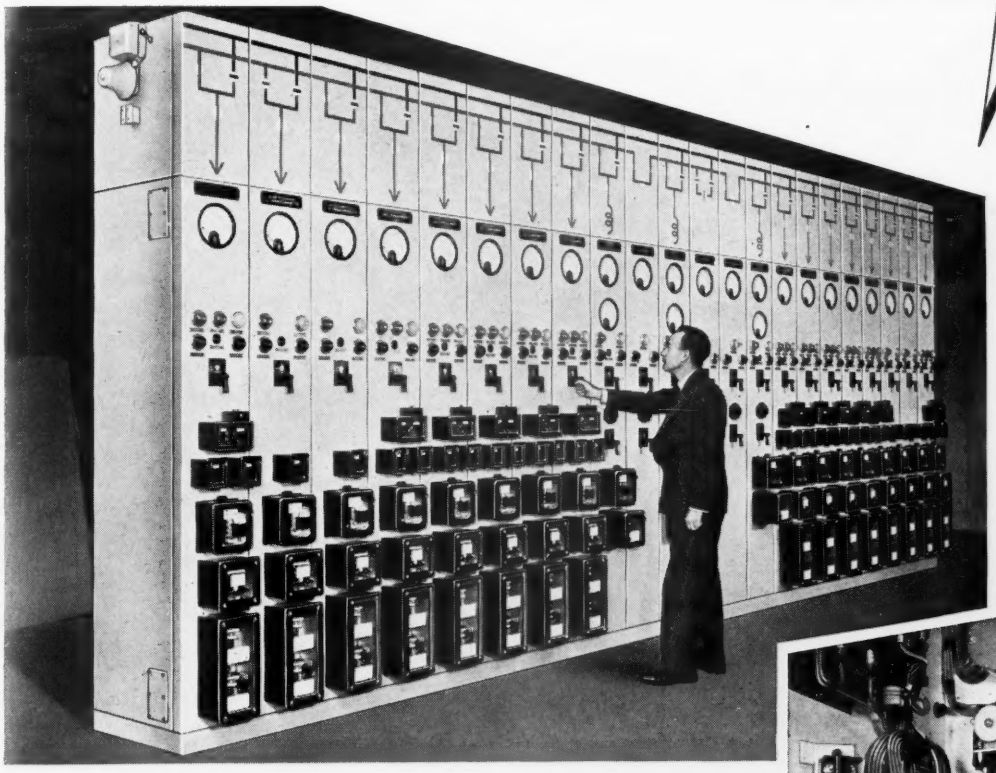

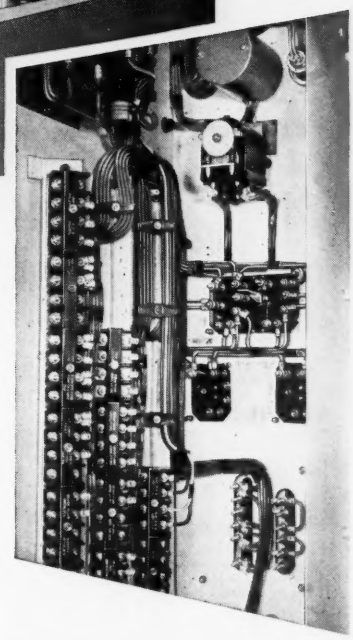

Shown here is part of
a recently completed order for
a 66 panel control board.

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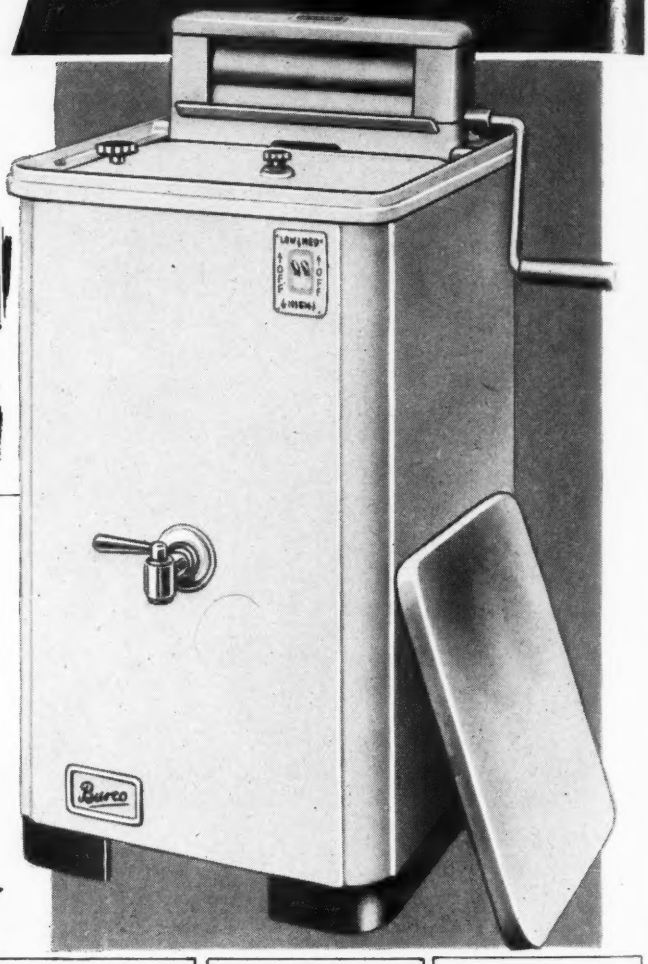
Burco MODEL E950

ELECTRIC WASHBOILER WITH FOLDING WRINGER



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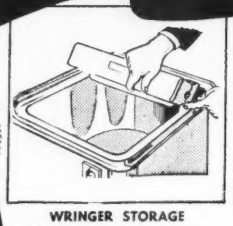
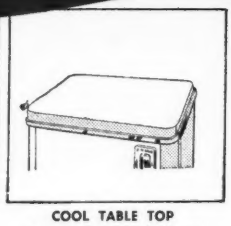
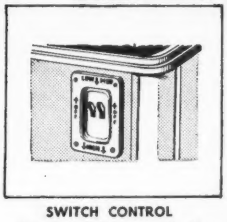


WRINGER STORAGE
The wringer can be swiftly folded inside the container and the enamelled table top makes a useful addition to kitchen equipment.



COOL TABLE TOP
of porcelain enamelled steel which enhances the appearance whilst providing additional working space.



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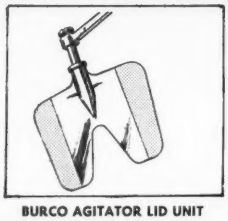

BURCO AGITATOR LID UNIT
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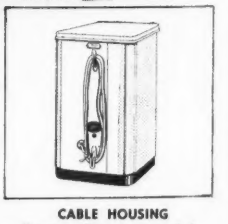

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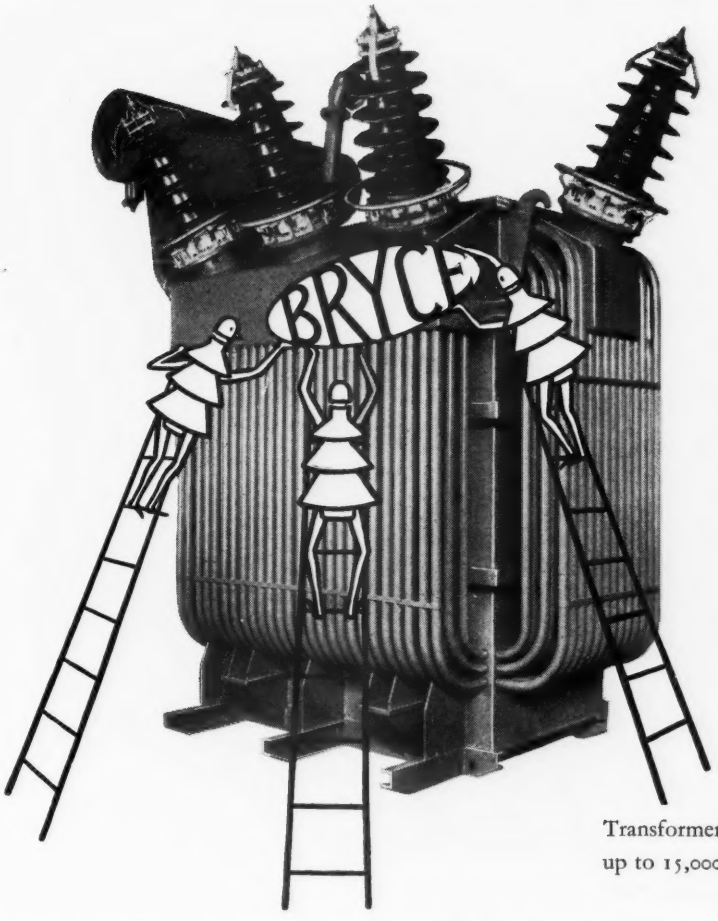

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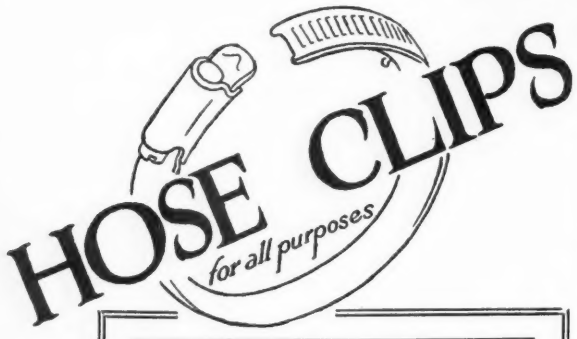

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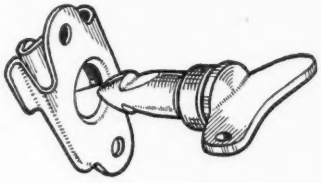

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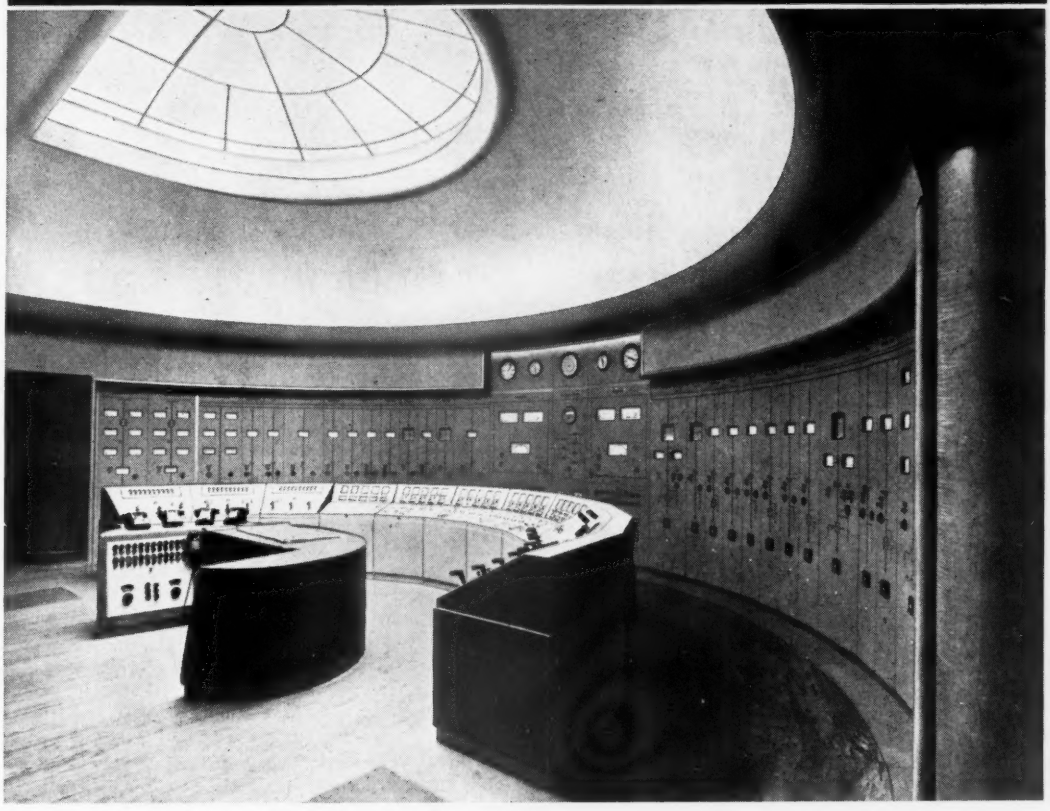

Power-station corridor-type control-board for generators, transformers, and feeders, with generator control-desk and control-engineer's logging-desk in the foreground

specialists in switchgear and control-apparatus

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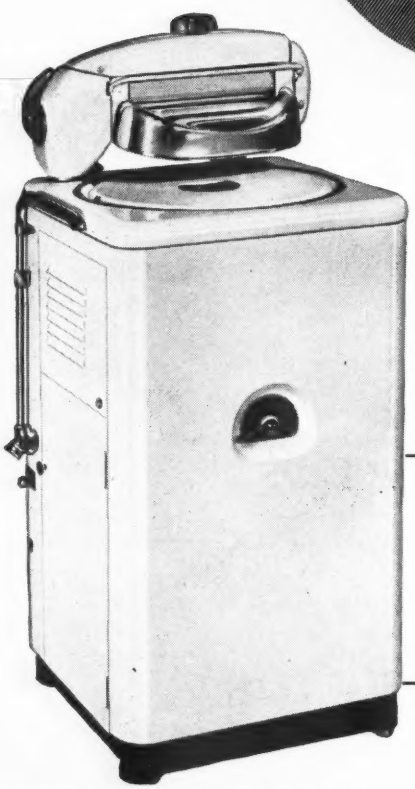

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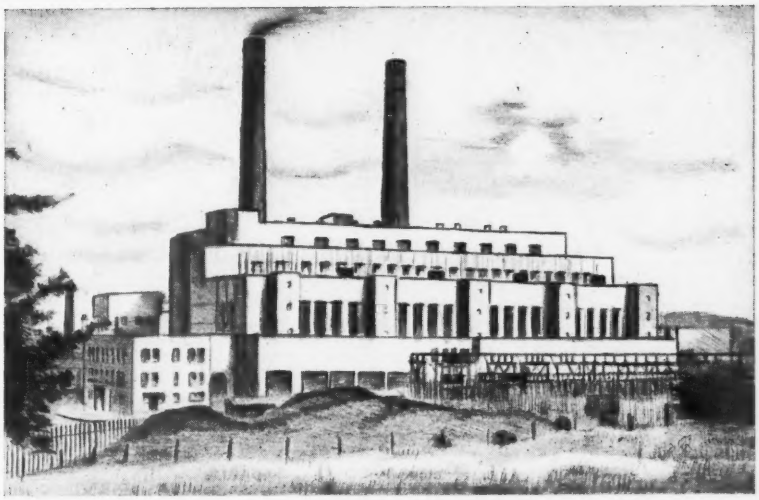
"YORKSHIRE" TUBES FOR OIL COOLERS, FEED WATER HEATERS, EVAPORATORS, HYDROGEN COOLERS, SWITCHGEAR SOCKETS AND CONNECTIONS, BUS-BARS, ETC.



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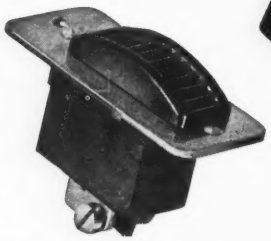

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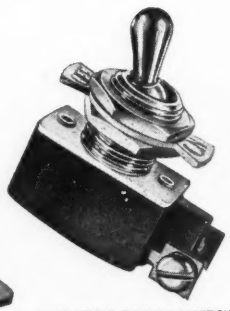
3 amp., 250 volt



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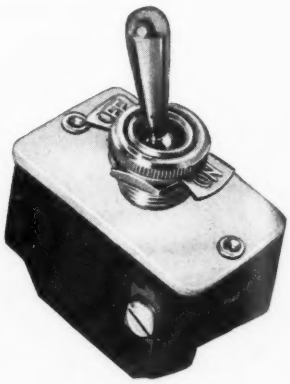

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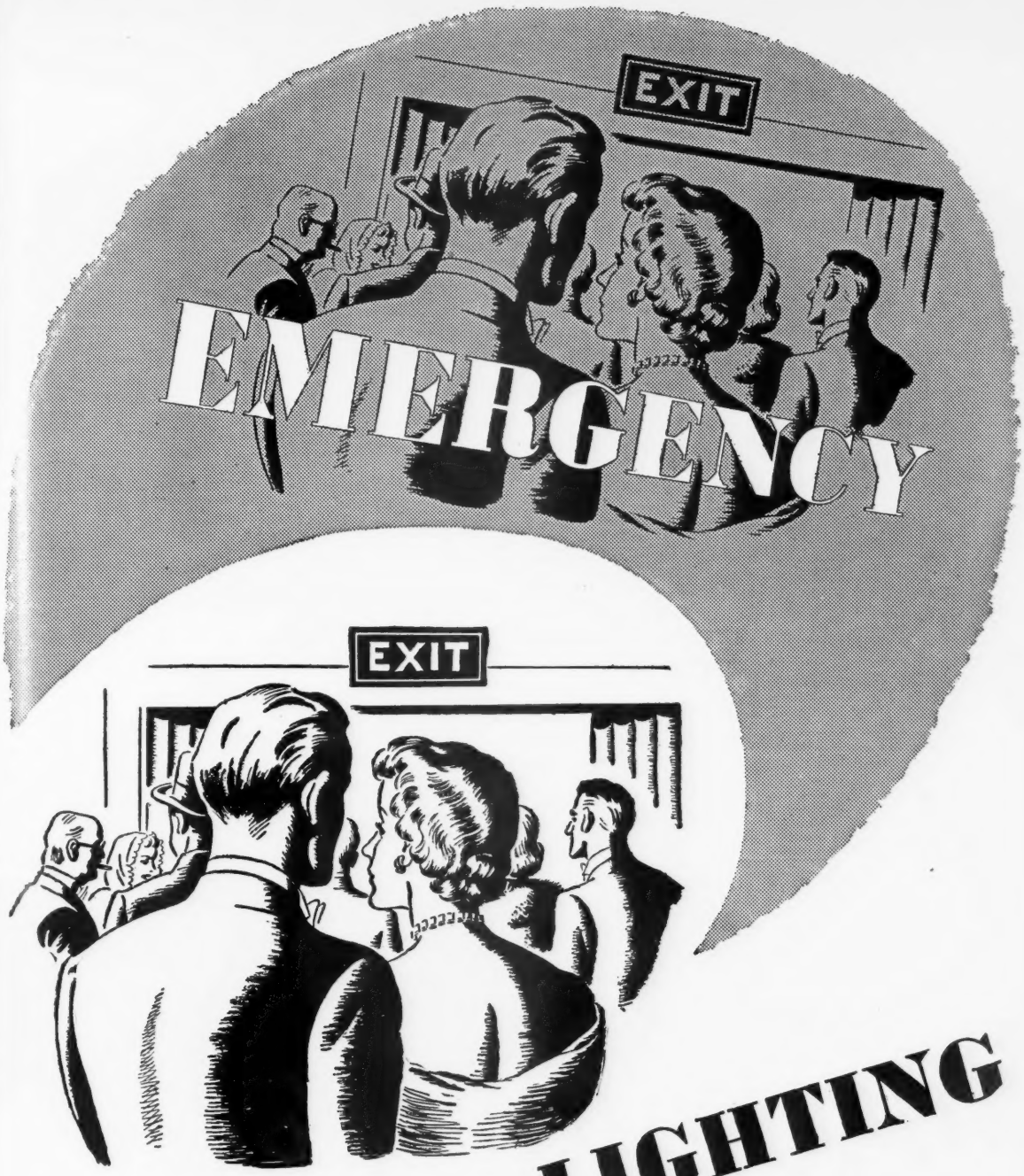

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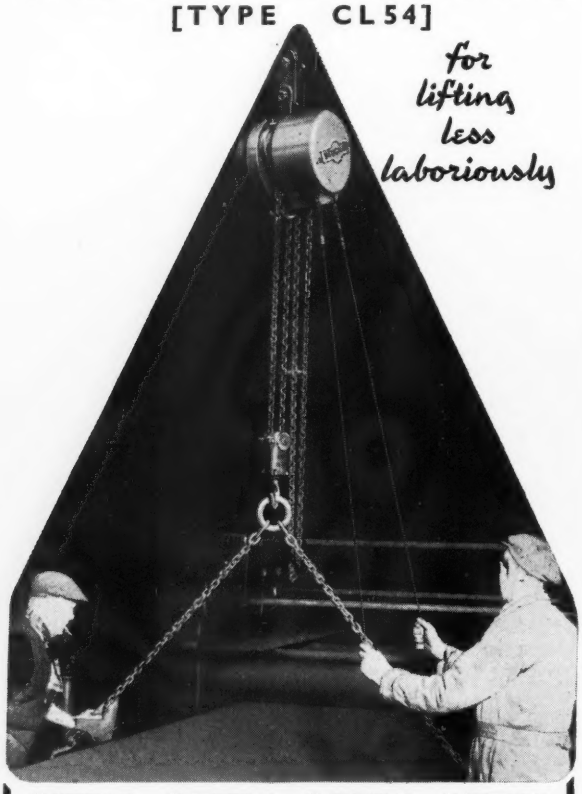

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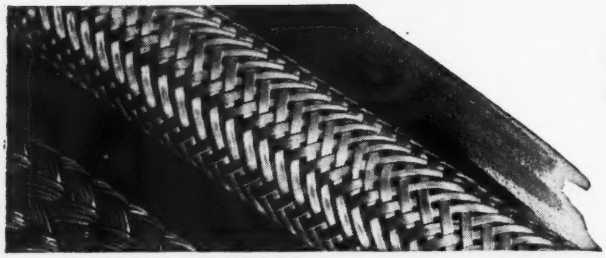

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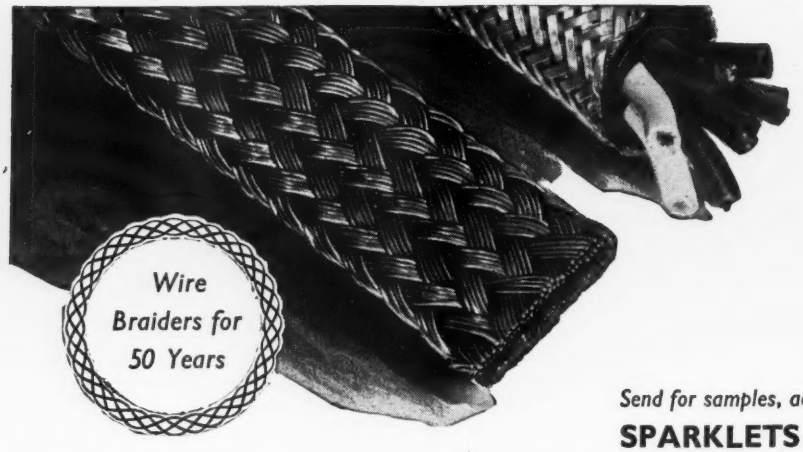

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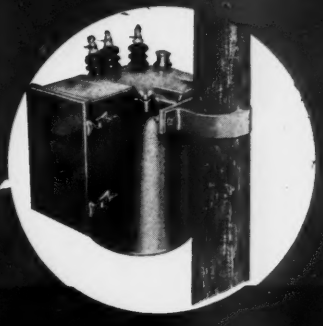

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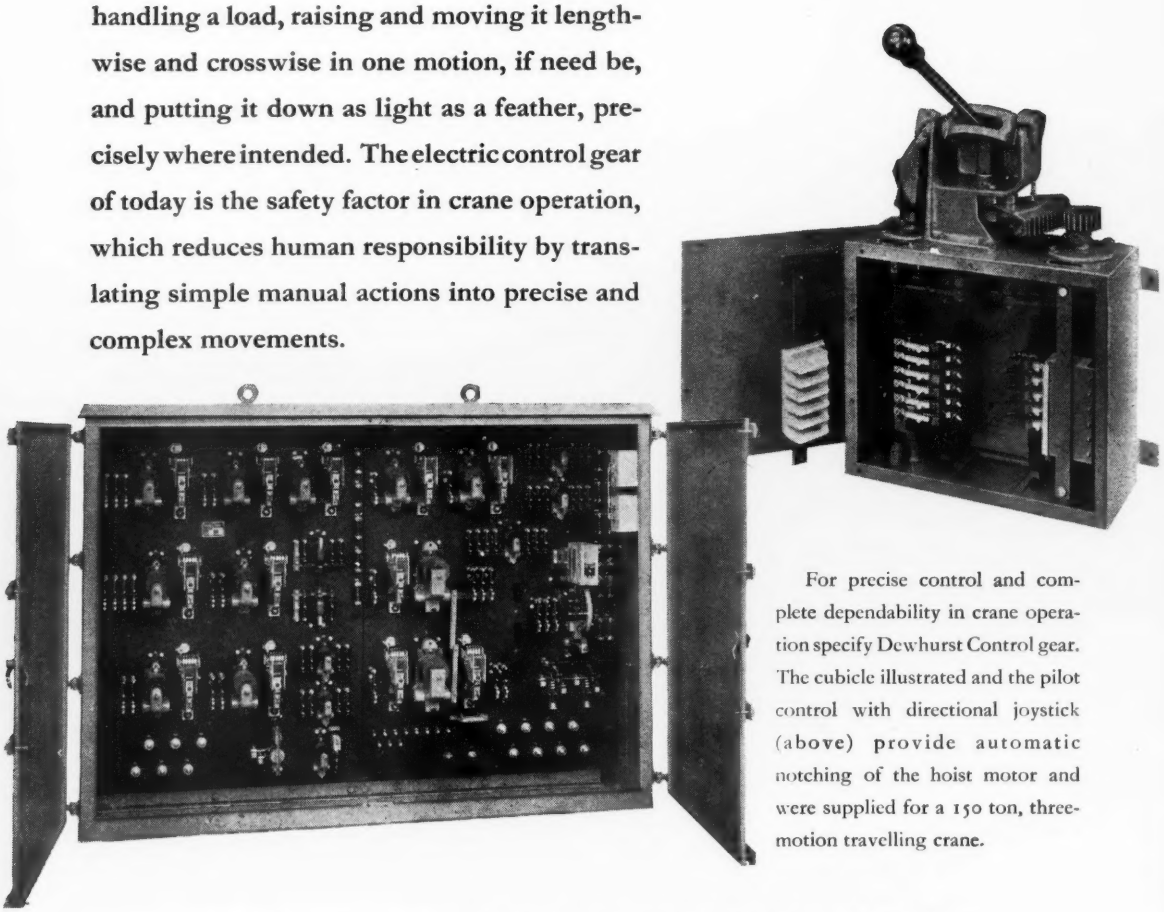

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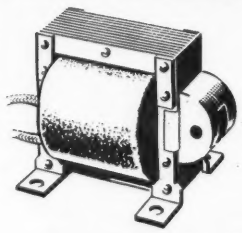

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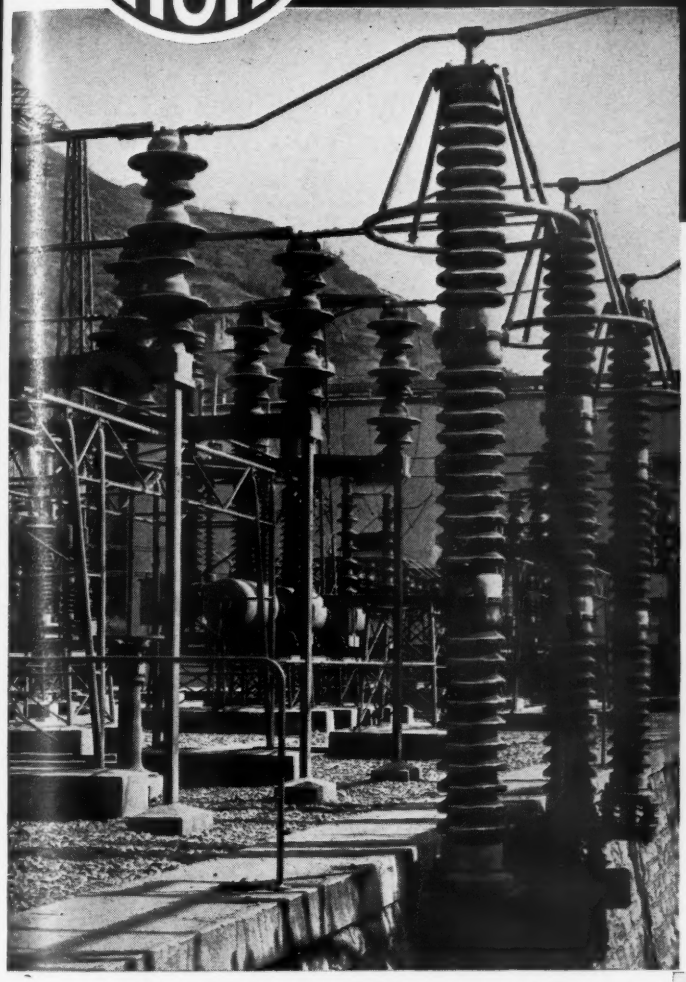

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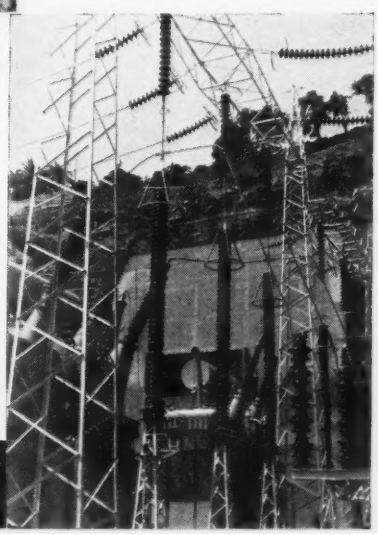

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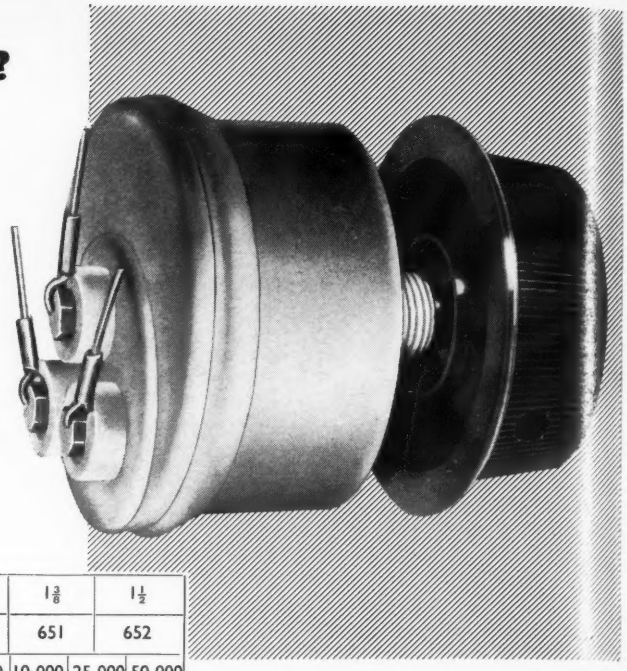

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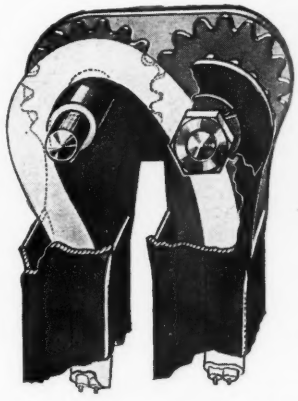

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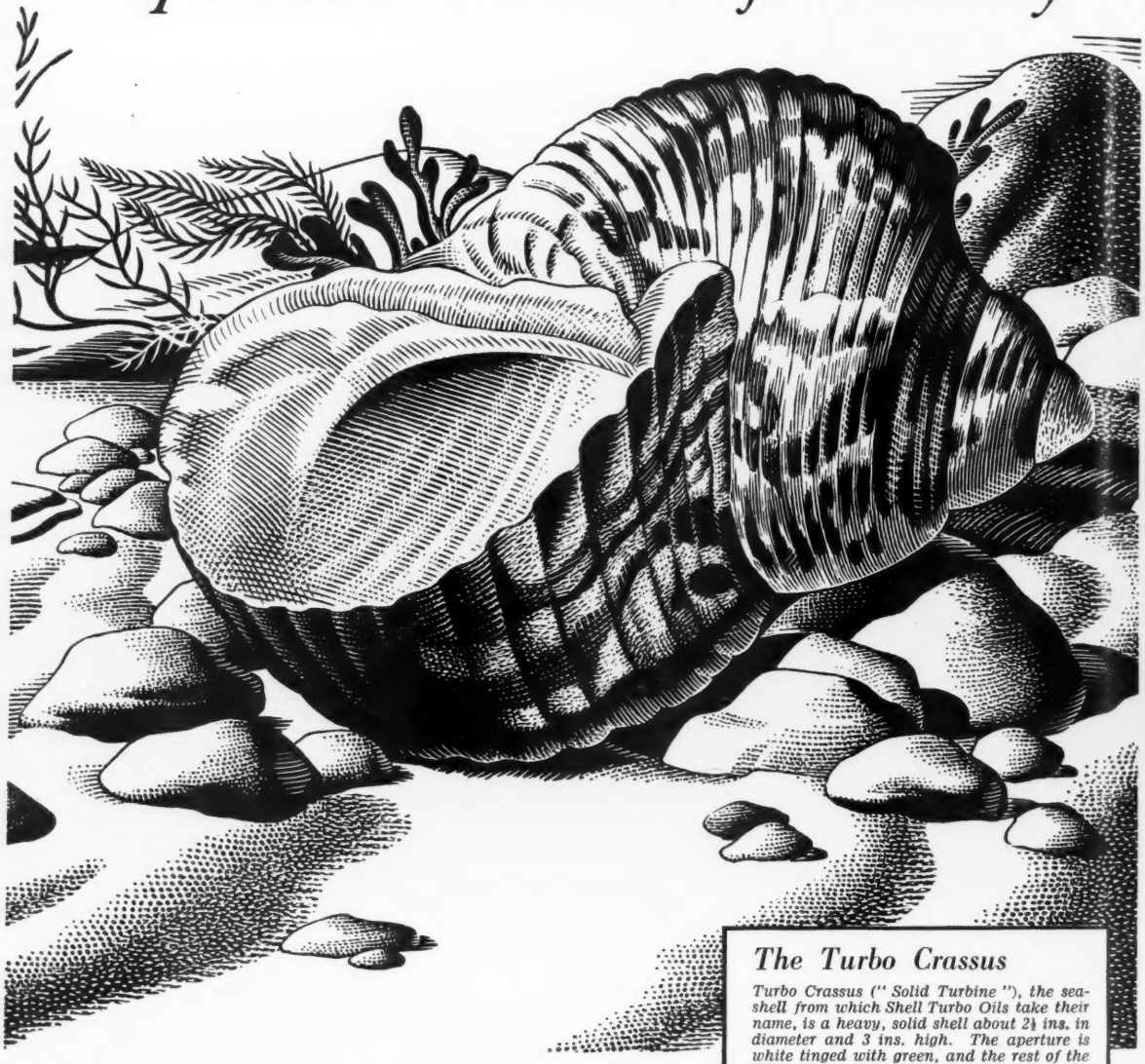

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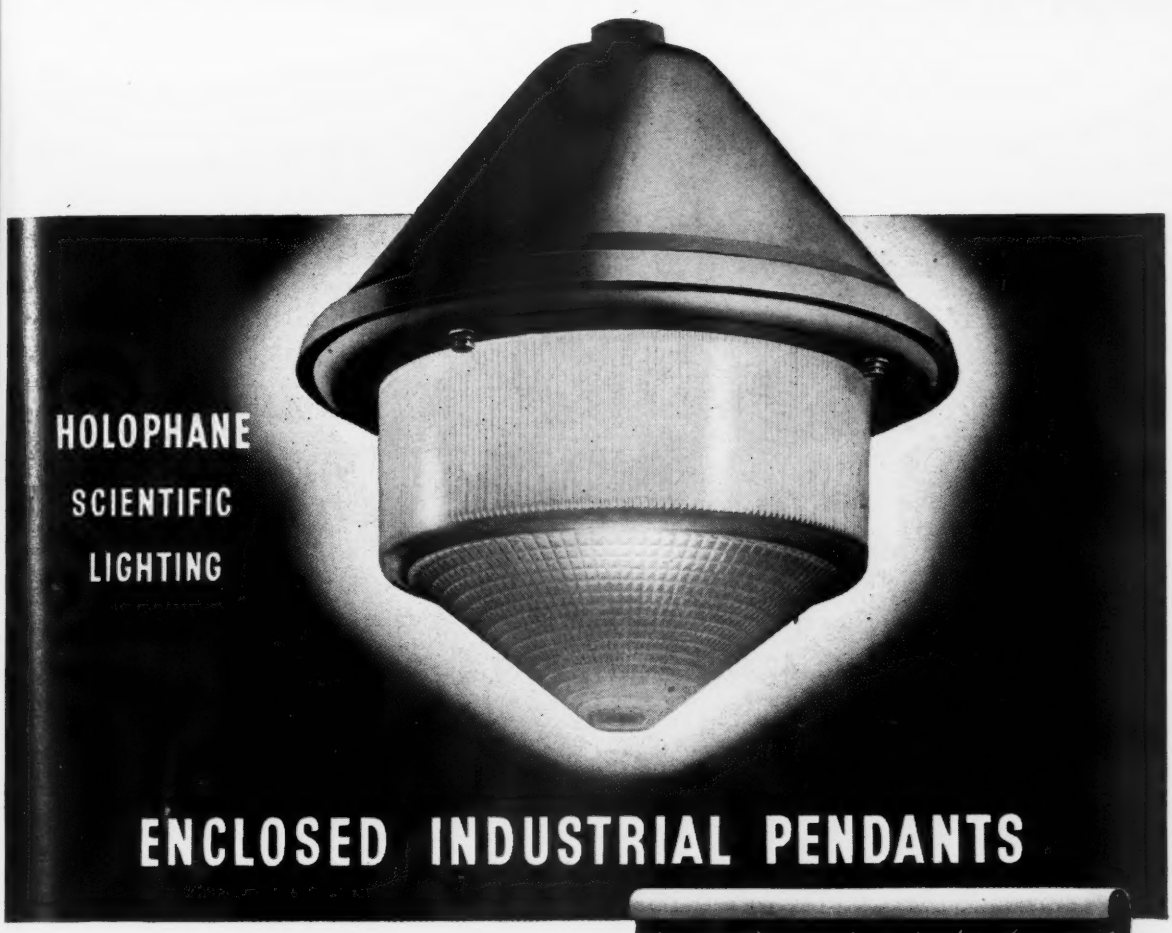

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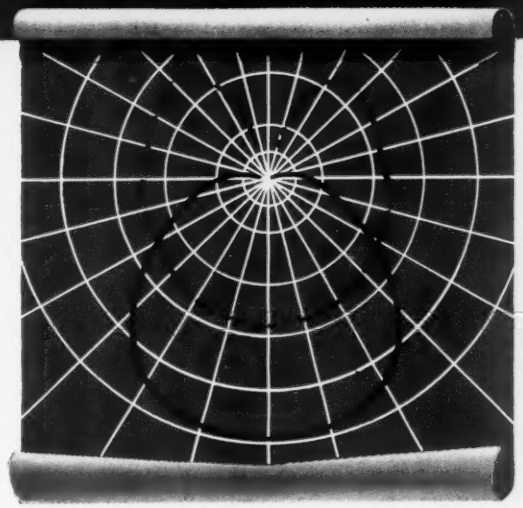

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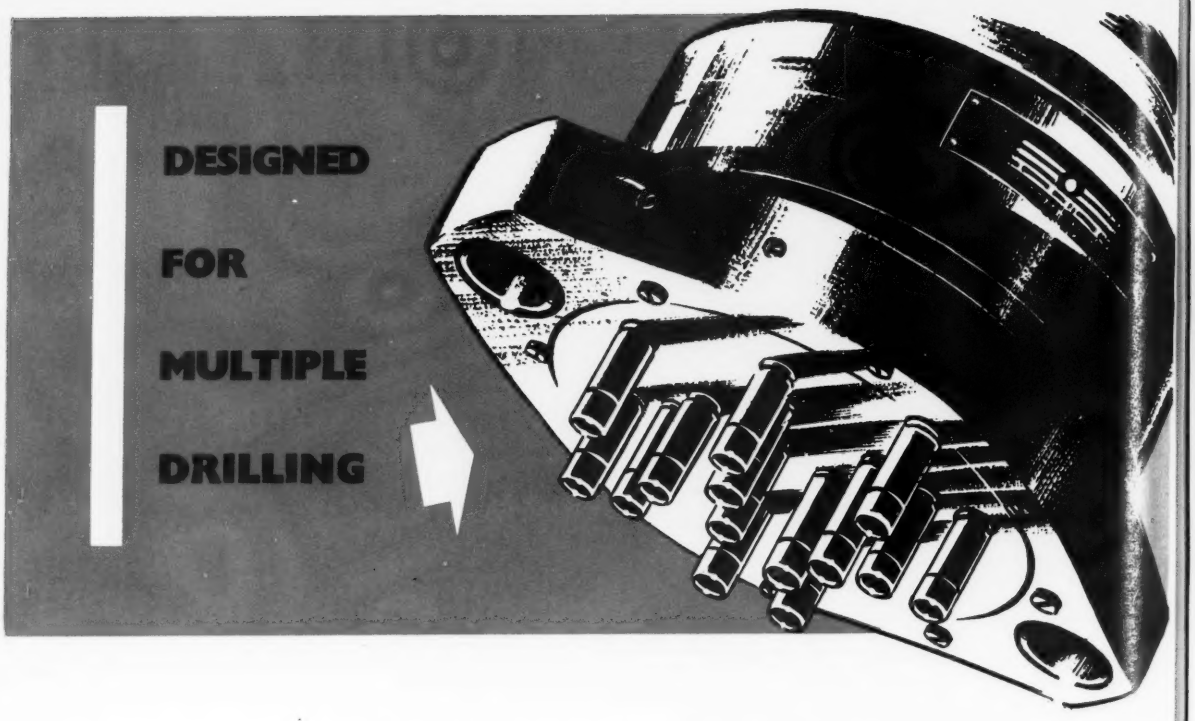

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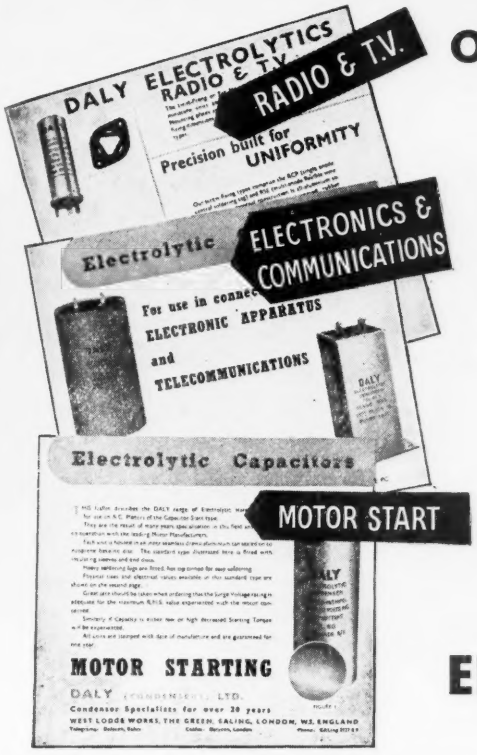

One [or more] of these leaflets is for YOU...

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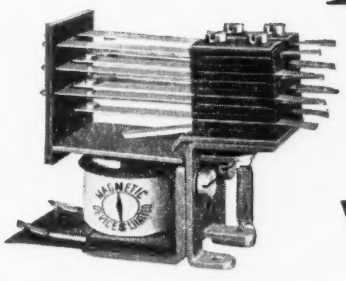

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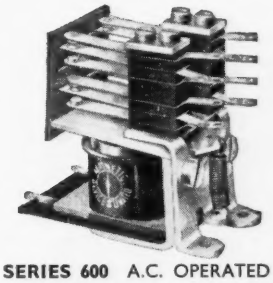

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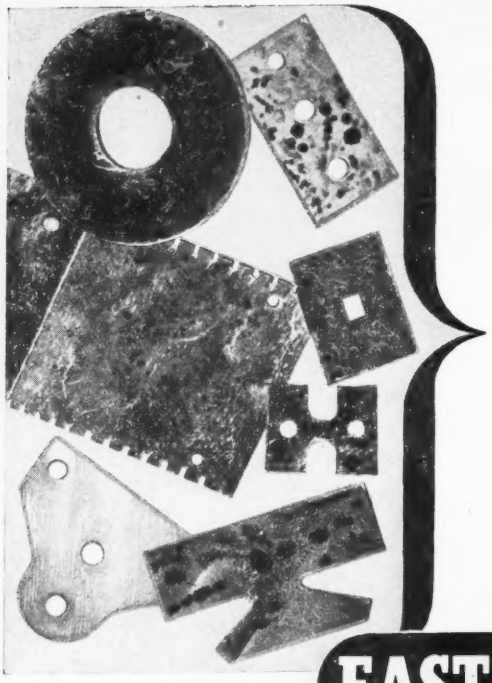

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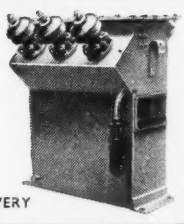

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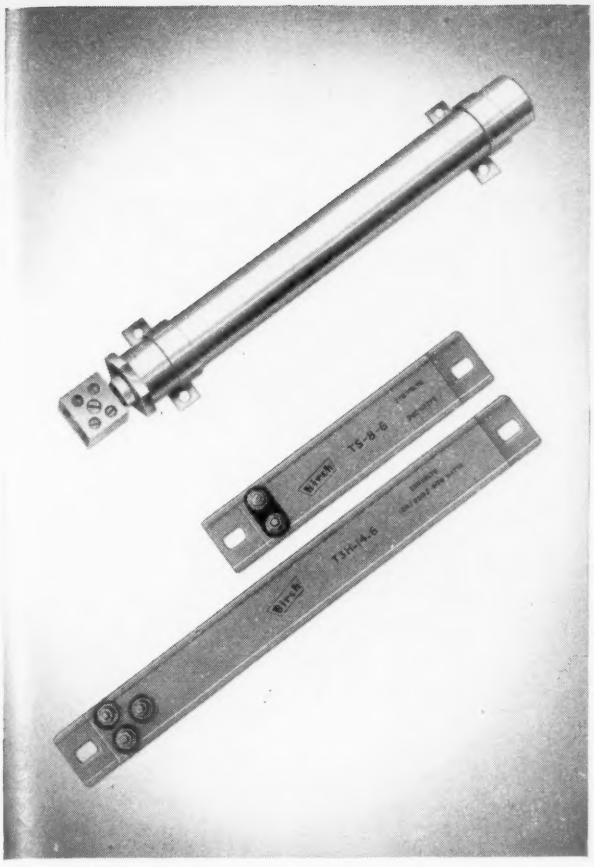

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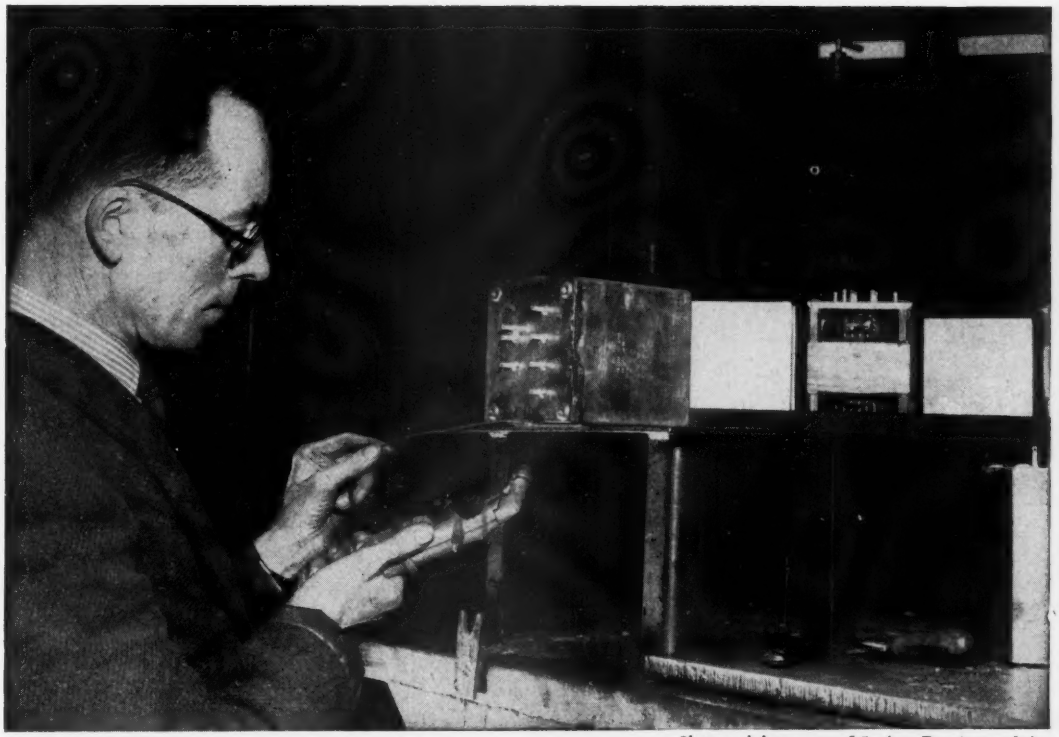

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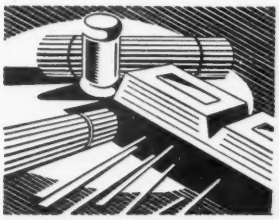

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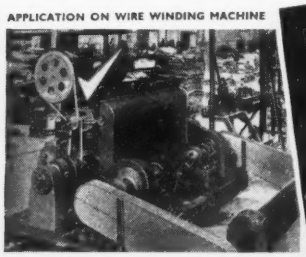

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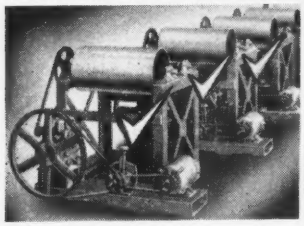

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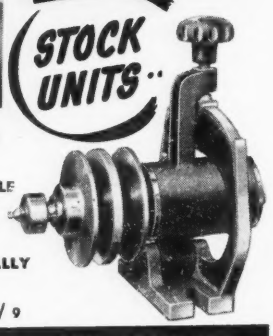

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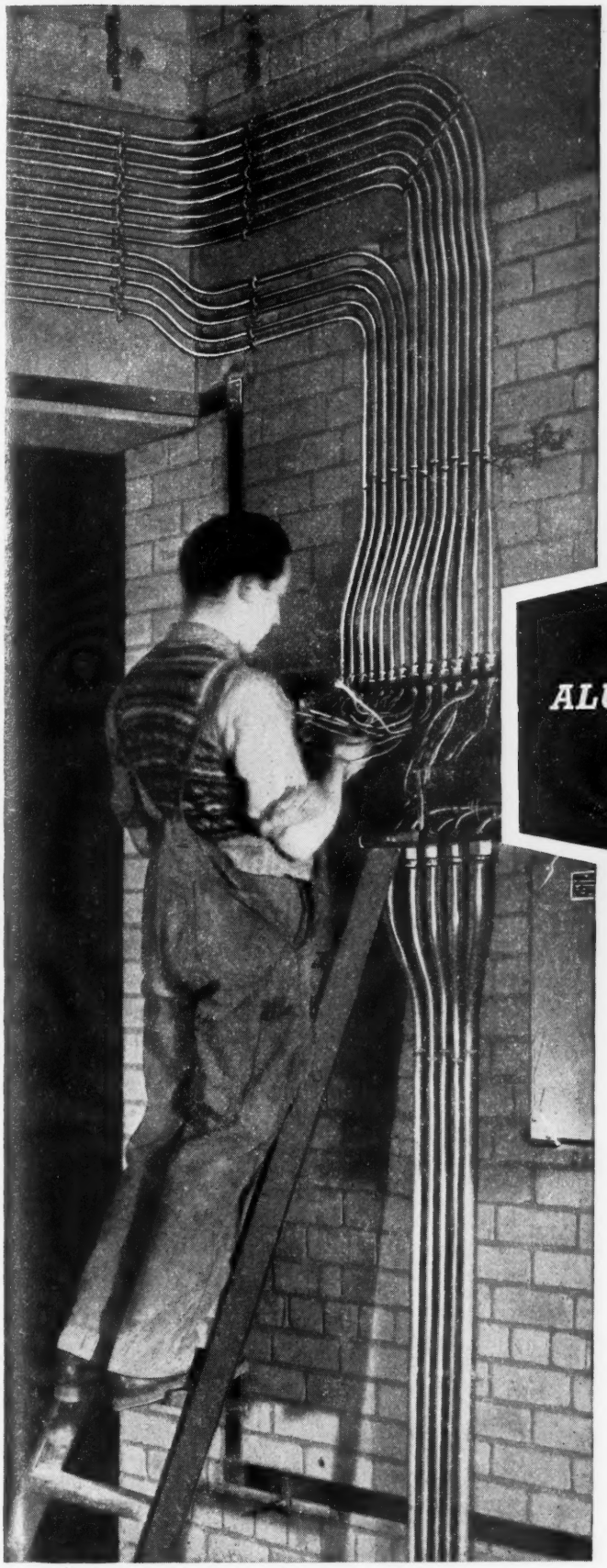

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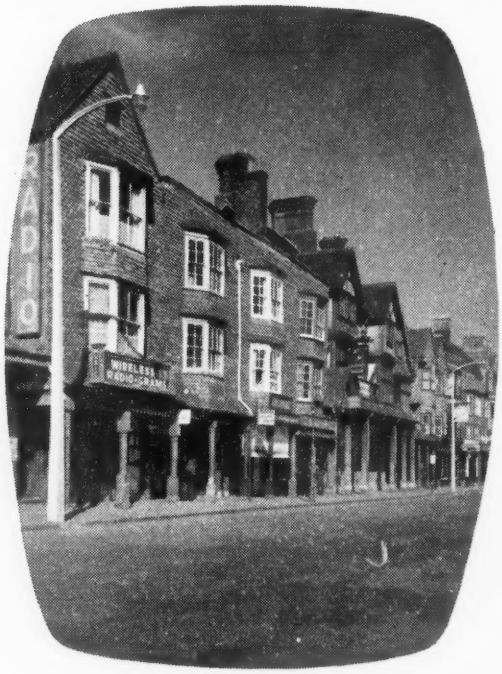

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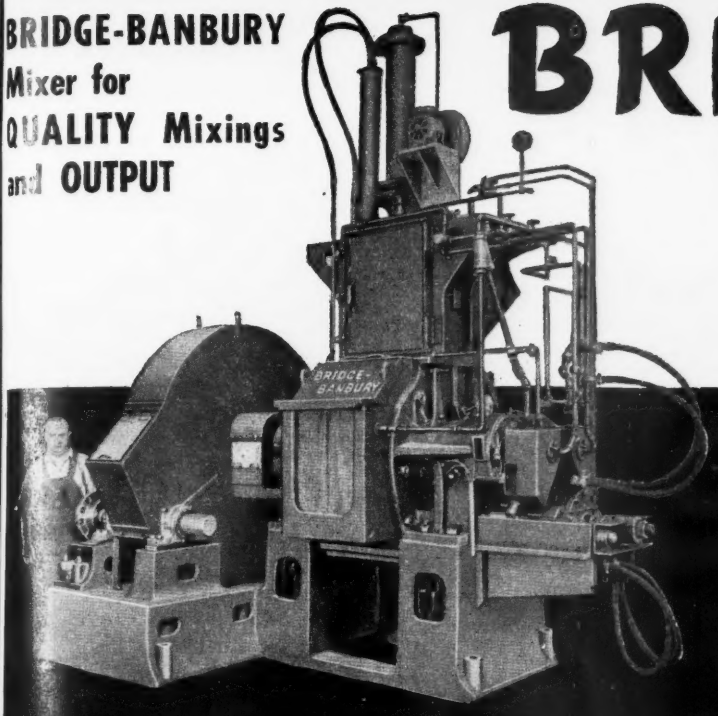

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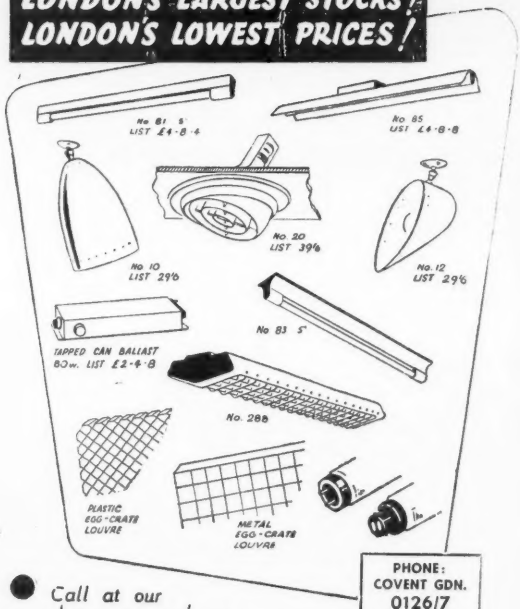

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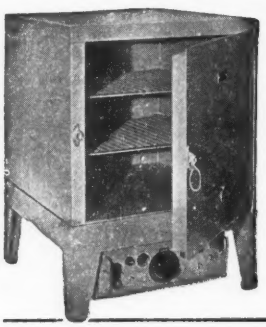

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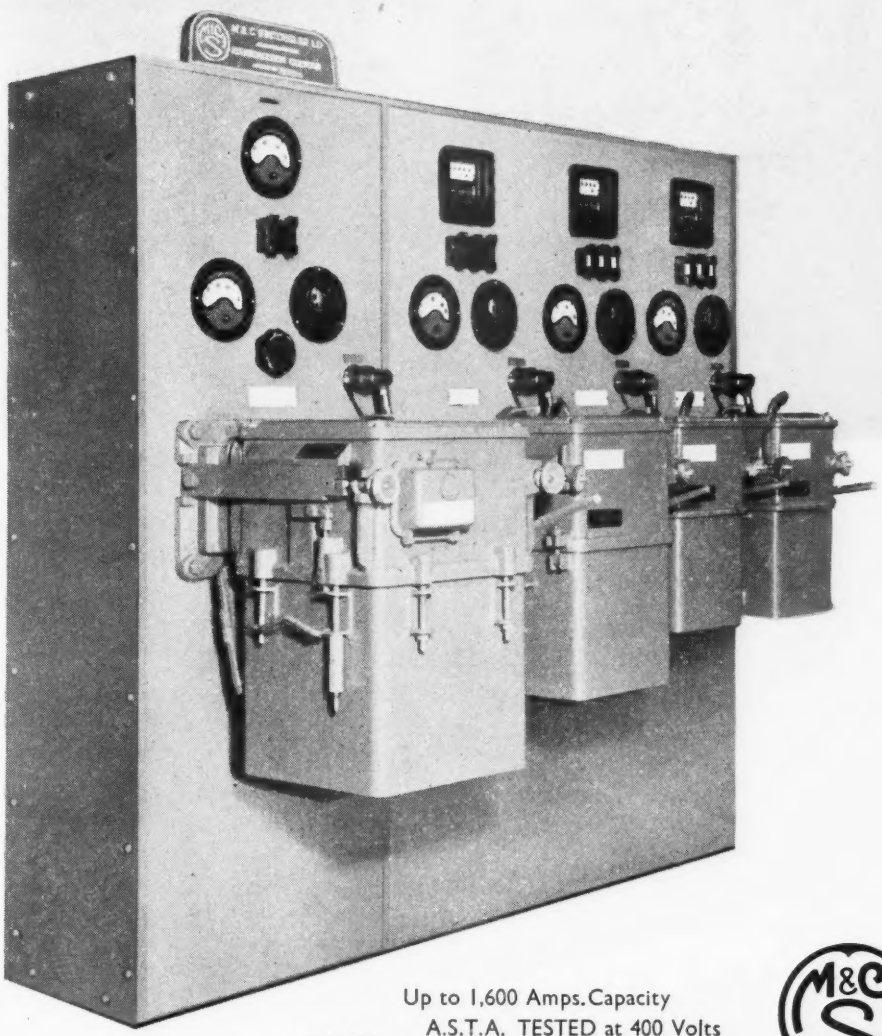

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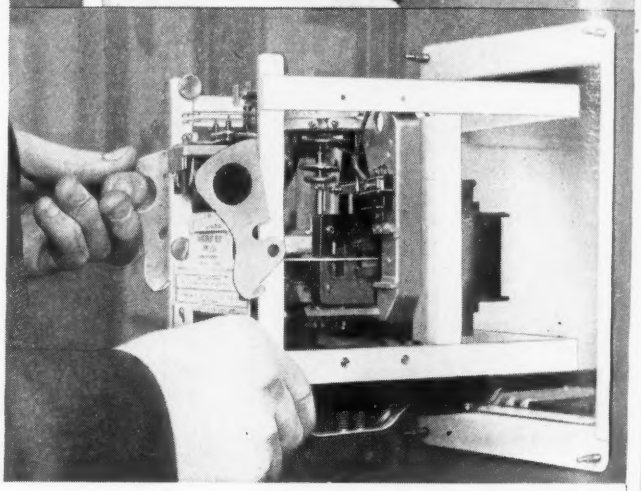

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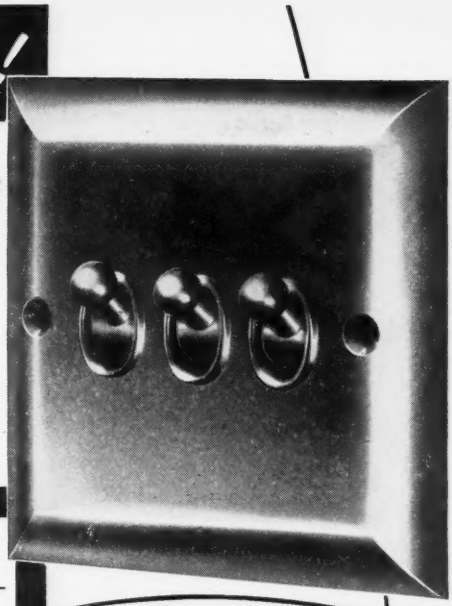

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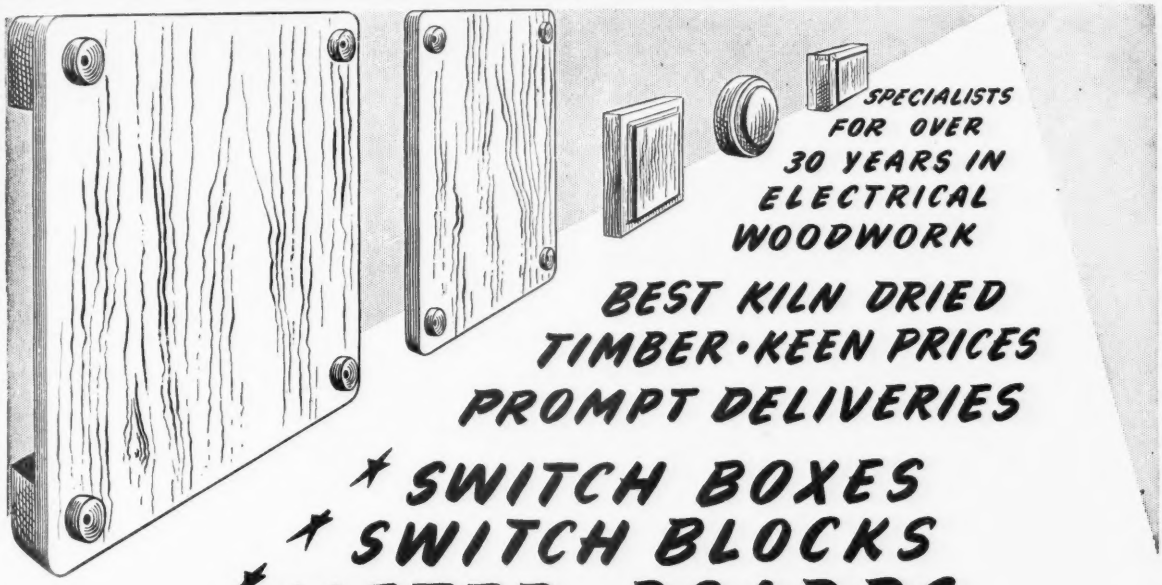

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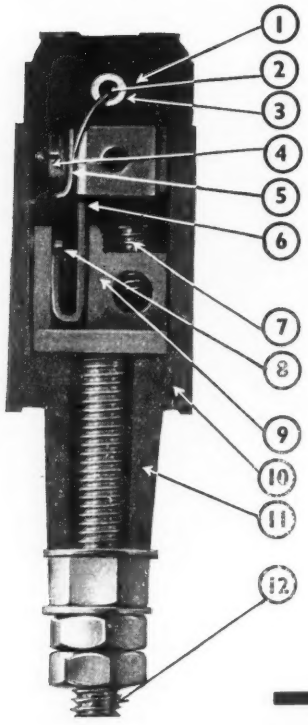

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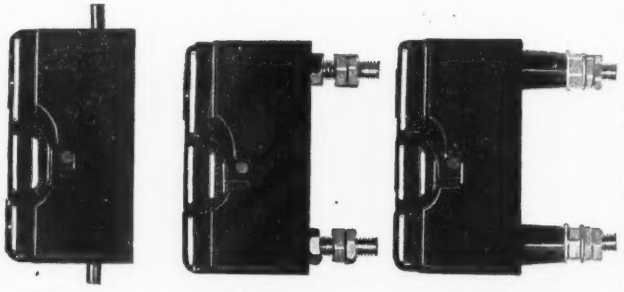

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6 AUGUST 1954

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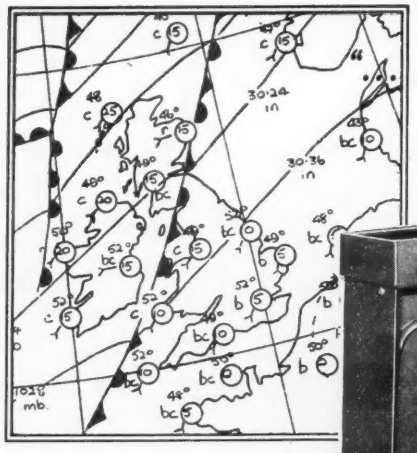

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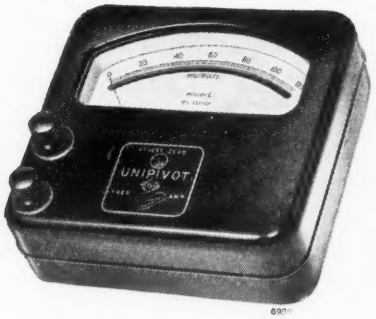

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ELECTRICAL REVIEW

6 August 1954 Vol. 155 No. 6 Established 1872

Fuel Saving in Industry

IN a publication entitled " The Four-Way Service of N.I.F.E.S.," the newly formed National Industrial Fuel Efficiency Service exhibits a sense of reality in its approach to the problem of enlisting the active aid of factory owners in reducing waste of fuel, expressed in terms of saving nine million tons of coal a year. The crux of the matter is that the cost of power in most cases forms but a small percentage of the price of a manufactured article. While the works engineer can usually point out many ways in which fuel economy is possible, the production engineer understandably fears disturbance to his manufacturing schedule, just as he did in the early days of industrial electrification. It is for management on the highest level to reconcile the two viewpoints, having regard to considerations of long-term policy. In addressing managements primarily and giving prominence to fuel economy as an aid to higher productivity, the document appears, therefore, to be on the right lines. An incentive to divert available capital to the provision of fuel-saving equipment is given under the Government loan scheme by which the initial cost of the equipment would be recoverable within seven years out of gross savings in fuel, the loan being interest-free for the first two years.

Another incentive is also required and that is to boiler attendants, who should be encouraged to qualify by training for the upgrading which an adequate understanding of combustion merits. Capital expenditure may, however, be less than might at first appear, since about four times as much loss is said to occur in the use of steam as in raising it and would cost much less to rectify. The four classes of service rendered by N.I.F.E.S. are summarized elsewhere in this issue. These range from a charge-free look round the plant, which to a fresh eye on the job is likely to reveal easily remedied defects, to a thoroughly worked out performance test, making a diagnosis on which a consultant, from his intimate knowledge of the modern combustion devices available, could base a scheme of reorganization. A so-called " quiz," relating to present arrangements, is practical and to the point and is commendably brief. Further information would no doubt be obtained later on such matters as whether a lower grade of coal could be burned; whether electricity could not profitably be substituted for other means; and whether local steam raising could not be dispensed with in favour of electricity efficiently generated in large public supply stations.

Factory owners could offer further aid to the fuel economy campaign by permitting publication of their own results of taking the advice of the N.I.F.E.S. organization. We use the word " economy " here advisedly as meaning the best use of fuel rather than its mere conservation.

WINTER PROSPECT

The British Electricity Authority got through last winter with only one short-period power cut, whereas in the winter of 1952–53 there were nine cuts. So far has the plant position improved that the Electricity Sub-Committee of the Joint Consultative Committee is able to predict that load shedding will be unnecessary next winter—provided that it is not worse than average. Nevertheless it is regarded as necessary to have load-spreading arrangements ready for application in the event of cold snaps. In any event voluntary load spreading is a good thing in itself if it can be accomplished without dislocation or too-great inconvenience. Private generating plant is still to be encouraged and an appeal is to be made to domestic consumers to exercise restraint in the use of electricity during winter peak periods. It appears that the greatest risk of trouble exists in the Bristol and Glasgow grid control areas.

G.E.C. RECOVERY

When last year the General Electric Co., Ltd., had to report a heavy decline in profit, although the rate of ordinary dividend was maintained, the principal reason was said to be a steep fall in sales of " consumer " goods both at home and abroad. The report for 1953 54 shows that there was a substantial recovery, although the profit was still below the level of 1951–52. Nevertheless the decision to increase the total dividend from 11¼ to 12½ per cent is fully justified by the results. The improvement is attributed to increased turnover in both capital and consumer goods, although again profit margins were reduced in many cases. Competition from countries with wages and conditions inferior to those in this country continues to increase. This is now being countered to some extent by the improvement in home sales of consumer goods, following the raising of the ban on sales promotion. It is satisfactory to have this confirmation of the beneficial effects of a decision which has been decried in some quarters.

WHOSE BAN ?

In its comments on the G.E.C.'s annual report *The Times* says that the company " benefited appreciably from the lifting of the British Electricity Authority's ban on the promotion of sales of domestic electric appliances." It is strange that the B.E.A., which, with the Electricity Boards, suffered from the ban, should be debited with its authorship. It is true that because of conditions at the time the Authority was unable to protest very vigorously but it " worked on " the Minister of Fuel and Power until, at last, he restored freedom to both the gas and the electricity supply industries to publicize their services. The unwisdom of the prohibition was demonstrated in the reports of domestic appliance manufacturers for 1952–53 and confirmed by the improvement which has been apparent since the ban was removed.

ATOMIC HEAT

At the moment it seems that the only likely medium by which atomic energy can be put to the peacetime service of mankind is normal electricity supply. But to believe that the electricity supply industry will remain the sole agency is to be too optimistic. For instance, we find it difficult to believe that in the case of large-scale industrial heating, as distinct from space heating, heat energy from the nuclear reactor would be likely to be converted into electrical energy and then reconverted to heat energy for use in the various types of furnaces, including, perhaps, the blast furnace.

ELECTRICIANS' HOLIDAY PAY

An agreement between the National Federated Electrical Association and the Electrical Trades Union provides for an annual fortnight's holiday with pay for operatives in the electrical contracting industry. One part of the scheme stipulates the use of cards upon which stamps representing the employers' weekly contributions are affixed. An electrician leaving one employer for another is handed the card and passes it on to his new firm. It may have been thought that this arrangement applied only to members of the N.F.E.A. but an award by the Industrial Disputes Tribunal (reported in this issue) makes it clear that this is not the case. The E.T.U. sought to compel a non-federated firm to comply with the conditions of the scheme in the case of its members employed by the firm. Although the firm told the Tribunal that it had " contracted out " of the scheme, the Tribunal decided that the claim of the union should be allowed. It should be said that the firm pays holiday money but it objected to the stamped-card arrangement.

SCOTTISH BOARD APPOINTMENTS

Speculation about the chairmanship of the proposed new South of Scotland Electricity Board was ended last week when the Secretary of State for Scotland told the House of Commons that he proposed to appoint Mr. J. S. Pickles as chairman and Sir Norman Duke as deputy chairman; they are at present chairmen of the South West and South East Scotland Electricity Boards, respectively. While holding Sir Norman Duke's administrative experience in high regard, electrical engineers will be gratified that one of their number has been selected as chairman of the new Board. The combination of Mr. Pickles' engineering knowledge with Sir Norman's qualifications should produce good results. It is also worth mentioning that the appointments show the Minister to have been free from excessive nationalism, for while Sir Norman is a Scotsman, Mr. Pickles was born in Yorkshire.

Continuing our series of illustrated surveys of domestic electrical apparatus we shall be dealing with cookers in our issue of 20th August. Details will be given in tabular form of dimensions, hob equipment, loadings, controls, special features, finish, price, etc. These surveys are proving of great value for reference purposes and, as the demand is likely to be heavy, orders for additional copies of the *Electrical Review* should be placed without delay

STEELWORKS EXPANSION

Dorman, Long Installations at Lackenby

THE post-war developments of Dorman, Long & Co., Ltd., have been framed to secure a large increase in production by reconstruction at the existing works and their integration with new plants on undeveloped sites. The work is being undertaken in three stages the first of which, completed in 1949, included the provision of modern ore unloading equipment, ore preparation and sinter plant at the Cleveland Iron and Steel Works. Stage 2, finished at the end of 1953, comprised the doubling of the ore preparation and sintering plant and the putting into operation of an open hearth melting shop on the 680 acre site at Lackenby which links the company's Cleveland and Redcar works. The third stage provides for the installation at Cleveland of two new blast furnaces, a coke oven plant, a new blooming mill, a new medium section mill and a new high capacity rod and bar mill. At Lackenby there will be built alongside the open hearth plant a combined universal beam and heavy section mill.

In the melting shop at Lackenby there are five 360 ton basic open hearth tilting furnaces and two 600 ton active mixers. These units are supplied with molten iron from both the Cleveland and Redcar works on internal lines. The railways on the plant handle over 25,000 tons per week of incoming scrap, raw materials, outgoing ingots and works "ballast." There are exchange sidings, to hold 500 wagons, and sorting sidings, to hold another 700, with connecting lines to the British Railways and to the steel plant.

The plant is designed to produce 625,000 tons of steel ingots a year, but enough space is available to extend the melting shop to give an annual output of about 900,000 tons.

The main building is just over 1,000ft long and 232ft wide, and it contains three parallel bays for the casting cranes, the furnace charging machines and the stockbay cranes, with crane spans of 75ft, 65ft, and 65ft, respectively. The span of the girders carrying the casting crane over the furnaces is 125ft. The girders have a total depth of 16ft 6in and weigh 140 tons.

The furnaces are fired by oil but are designed for oil and coke oven gas or, alternatively, producer gas firing if required at a later date. Three storage tanks hold 850,000 gallons of oil, equal to two and a half weeks' supply, and can be replenished from either road or rail vehicles.

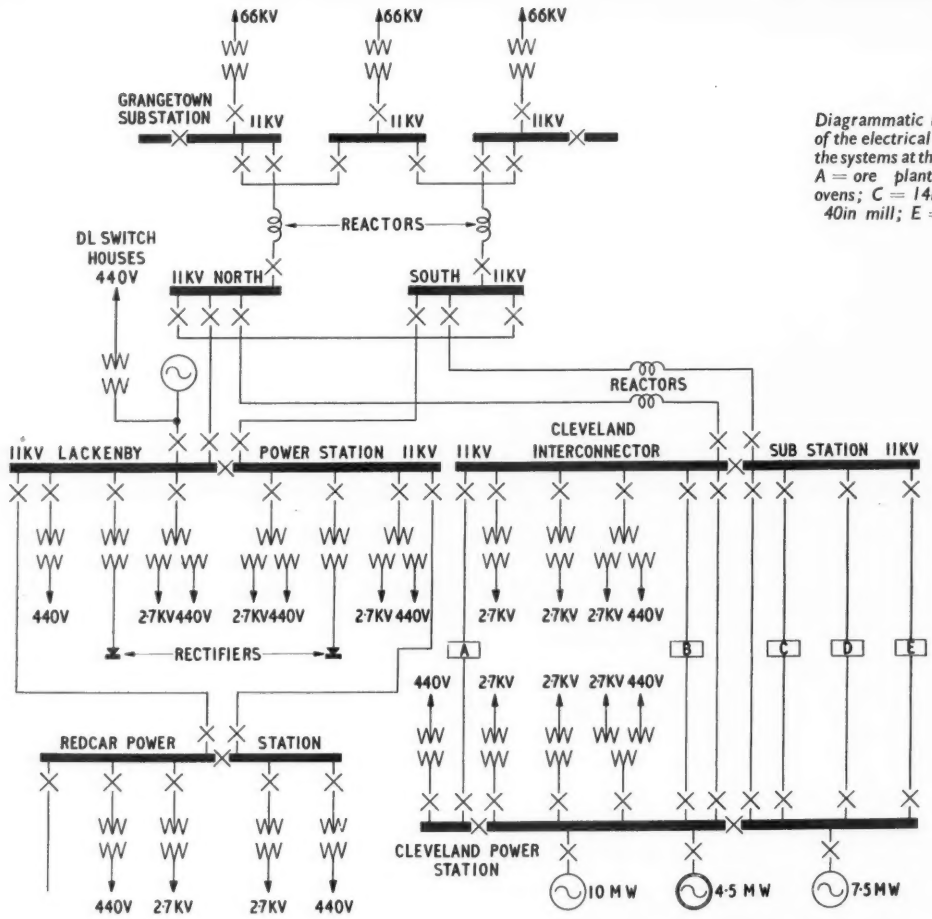
A special building for handling and preparing raw materials other than pig iron, scrap and scale has been provided. It houses plant for dolomite crushing, lime and limestone stocking, the preparation of mortar, fireclay and tarred dolomite, ferro-manganese crushing and the storage and handling of other furnace materials. Lime and limestone can be transferred direct from the storage bunkers in this building to feeders in the stock bay, from which furnace charging pans can be filled.

The stripper building, at the south end of the plant, where the moulds are removed from the ingots, is 280ft long with a crane gantry extended 245ft outside the building. A basic slag crushing and grinding plant capable of producing 2,500 tons per week of basic slag for agricultural purposes is also provided.

Electric power is supplied by a 5,000 kW turbo-alternator, generating at 11 kV, fed by steam from waste heat boilers at each furnace and mixer. This station is linked to other units at the Cleveland and Redcar works and to the public supply.

Although estimates showed that the maximum demand for electric power would only be in the region of 1,500 kW, it was considered necessary, in view of the future developments envisaged on the Lackenby site, entailing much heavier loads, to provide for a supply system which could easily be extended to cater for these developments, and which would also link up with the distribution systems at the adjacent Cleveland and Redcar works.

The system may be described as beginning at a new 11 kV substation situated adjacent to the North Eastern Electricity Board's 66 kV substation at Grangetown, with the necessary switchgear, reactors and ancillary equipment to give an automatic duplicate supply of 10 MVA at 11 kV. Although 10 MVA was regarded as the minimum requirement for the integrated system, a larger supply



Diagrammatic representation of the electrical integration of the systems at the three works. A = ore plant; B = coke ovens; C = 14in mill; D = 40in mill; E = No. 6 mill

would have entailed the installation of additional 66 kV switchgear and associated transformers. The reactors in the two incoming feeders from the Board are of the cast-in-concrete type, and are designed for a throughput of 15 MVA. A reactance of 10·5 per cent each is necessary to keep the short circuit rupturing capacity of the system below 350 MVA, the maximum value acceptable to the Board on its existing 11 kV switchgear.

From the new substation, two feeders, each 0·25 sq in, three-core, with associated pilot and telephone cables, are laid underground to the 11 kV switchboard in the Lackenby power station, and between Lackenby and Redcar works, a total distance of $3\frac{1}{2}$ miles. The feeders are equipped with " Solkor " feeder protection and back-up overcurrent protection, to give instantaneous isolation from the system in the event of a feeder fault.

Because of the area of the Lackenby works, it was decided to establish inside the works a primary distribution network at 11 kV. For a.c. motors of over 100 h.p., of which there are a number driving fans and pumps, a 2,750 V, secondary network, three-phase, 50 c/s is installed, and for smaller a.c. motors, a 440 V network. These two systems are similar to those already in use on the company's other works, and permit standardization of motors and switchgear. For electric overhead cranes on production work, the supply system chosen was d.c. at 230 V. This is a departure from the practice at all the company's other works, where 440 V a.c. is used. It was appreciated that a supply at 230 V would entail a heavier distribution system and more costly rectifying equipment than would be required for a higher voltage. In spite of this, the choice was considered to be justified by reason of the advantages inherent in 230 V d.c. motors.

The distribution system is designed to give duplicate supplies to all essential plant. The section switches are arranged so that each of the two steel plant power transformers supplies half the essential load, and that vital services, such as furnace circulating pumps, are fed from both transformers.

The 11 kV switchgear is at the Lackenby power station, which has been placed as near to the load centre of the works as the general layout would permit. Because of its central position, it houses one of the three main power transformers, switchgear for the 2,750 V and the 440 V systems, and the rectifying equipment and switchgear required for the 230 V supply to the overhead cranes in the melting shop. Three other substations have been provided, at each of which power at 11 kV is transformed down to the voltages required in the area served by the substation.

The 11 kV system is earthed at the Electricity Board's 66 kV substation. Provision has, however, been made for earthing the neutral point of the 5,000 kW alternator, if this should become necessary by the Lackenby system becoming isolated from the Board's feeders. The 2,750 V and 440 V systems are solidly earthed into a common system, using both cast iron plates and copper rods. The cast iron plates were used wherever excavations for foundations provided a suitably deep earthing point; elsewhere copper rods were driven in.

Each of the three main power transformers is of 3,500

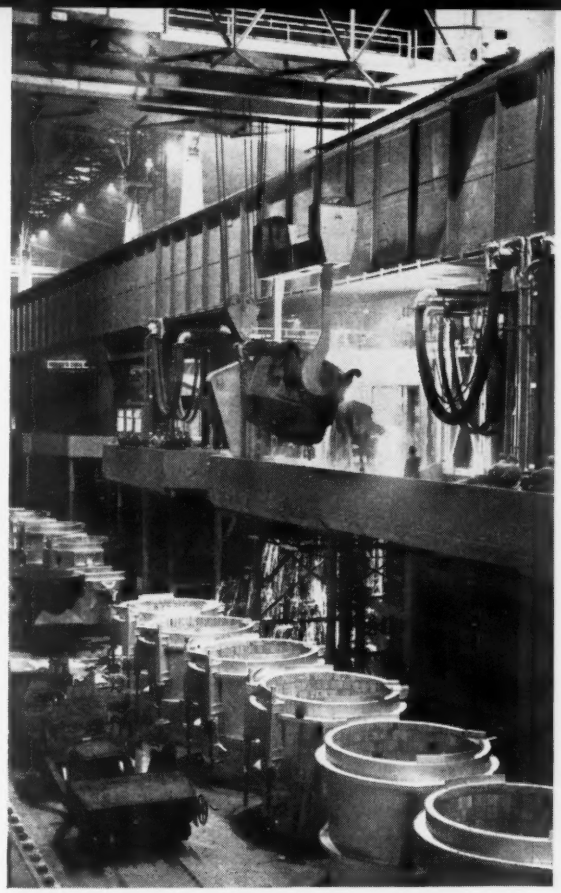
kVA capacity, and of the three-winding type, giving an output on the secondary side of 2,500 kVA at 2,750 V and 1,250 kVA at 440 V. The use of three-winding transformers follows a practice which was adopted some years ago at the company's other works, and is considered to be justified by the resulting economy in e.h.v. switchgear and space. The transformers have off-load tapping switches giving $\pm 2\frac{1}{2}$ per cent and 5 per cent regulation. All have oil conservators, silica gel breathers and the usual fittings. The fourth power transformer, at the engineering shops, is of 1,000 kVA capacity, 11 kV/440 V. Connections on the three-winding transformers are delta/star/star, and on the two-winding, delta/star. All the transformers have restricted earth leakage protection, with intertripping and back-up overcurrent protection on each winding.

For the melting shop cranes d.c. is provided by two 600 kW banks of rectifiers, each bank comprising two 300 kW side anode type pumpless steel tank units. Each bank is supplied from a 900 kW six-phase transformer, the extra capacity allowing for the addition of a further 300 kW unit to each bank if the d.c. load increases sufficiently.

For the overhead cranes in the maintenance shops and stripper building, there are two 300 kW rectifiers, each supplied from a six-phase transformer with a three-phase 440 V input. The 11 kV switches supplying the rectifier transformers are equipped with time-lagged overload and earth fault protection and instantaneous overload for protection against reverse operation.

The 11 kV switchgear comprises a 12 panel board of 800 A oil-filled circuit-breakers. They are solenoid operated, either from the control room on the turbine floor, or locally from the switch. To make adequate provision for the future growth of the system, and at the same time to avoid initial expense, the switchgear has a short circuit capacity of 350 MVA, but the frame stands, bus chambers and back portions are designed for 500 MVA, so that if it becomes necessary to increase the rating only new circuit-breakers will be required.

The 2,750 V switchgear comprises 75 MVA short circuit capacity, air insulated, 800 A and 400 A oil circuit-breakers, with vertical isolation. Switches for motors which are started direct-on-line, are solenoid operated by remote control from panels adjacent to the motors.

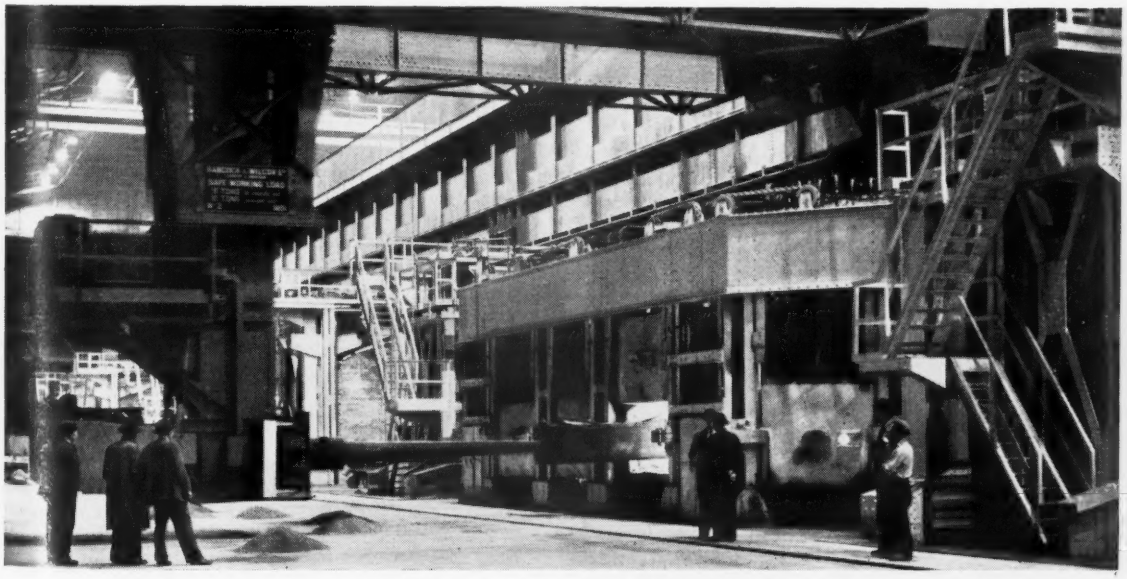


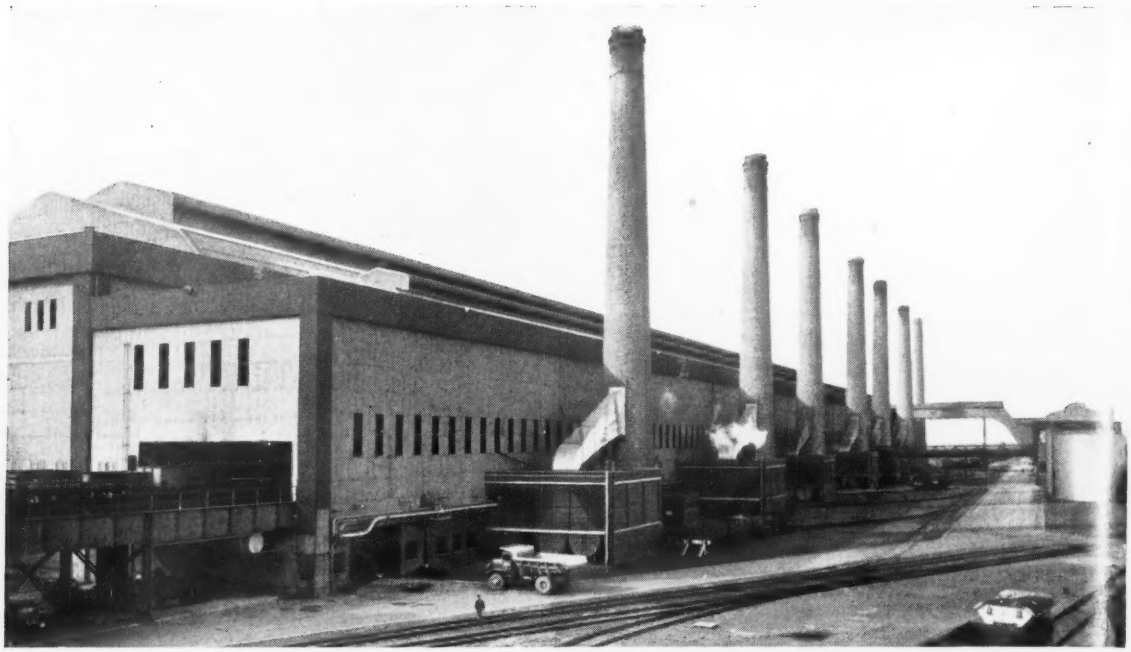
Delivering hot metal (molten iron) to a 600 ton mixer

For the 440 V system, air-break switchgear was chosen in preference to oil break, because of the former's advantages in reduced fire risk, better appearance and compactness. As the main lighting supplies are obtained from the 440 V boards, these are fitted with neutral busbars. No feeder earth-leakage protection is fitted, but equipment has been added to enable earth-leakage current to be measured.

On the 230 V d.c. system, the switchgear for incoming

Charging scrap into a 600 ton mixer





Melting shop showing waste-heat boilers on the right and oil storage tanks, lime and limestone gantry in the background

supplies from the rectifiers comprises 4,000 A, double-pole, hand-operated, air circuit-breakers, with instantaneous reverse current trips and direct acting time-lagged overloads. For outgoing circuits, 2,000 A, 1,000 A and 500 A double-pole breakers are fitted. Because both poles are insulated, earth-leakage lamps, together with a mA meter, indicate and measure the resistance to earth at either pole. The track isolators for the crane long travel conductors are fitted with key interlocks which prevent the switch being closed unless the key is inserted, and retain the key when the switch is closed.

On the desk of the control engineer in the power station is a 25 unit facia type miniature alarm panel, which gives a warning in the event of faulty operation of any of the primary and secondary switchgear or rectifier equipment. A contact which closes at the faulty unit causes an alarm bell to ring in the control room, and flashes the appropriate lamp on the miniature board. The control operator then presses his re-set button, which stops the bell ringing. The lamp remains lighted until the contact which initiated the alarm has opened.

All three-core cables for a.c. power distribution are paper insulated single wire armoured, hessian taped and compounded to B.S. 480 : 1942, and are suitable for use on an earthed system. The 11 kV cables are of 0·15 sq in section to keep within the thermal range of the system short circuit fault capacity. Cables carrying 2,750 V have a section of 0·25 sq in for feeder and transformer connections, and 0·04 sq in for connections to motors which are started direct-on-line. Cables for 440 V range from 0·3 sq in to 0·0045 sq in and are paper insulated, lead covered, steel wire armoured. For lighting, and for small a.c. power drives, extensive use has been made of mineral insulated, copper sheathed cable, as this type of cable was favoured for the high ambient temperatures around steel furnaces and in the roofs of furnace buildings. Cranes subject to excessive heat are wired in varnished cambric, asbestos covered or polychloroprene sheathed cable carried in steel trunking or conduit.

For the d.c. feeder cables, and other cables following the same route from the power station to the melting shop, it was decided to use single core drained paper insulated aluminium sheathed cable. While this cable, which was used in two sizes, 0·75 and 0·25 sq in, proved to be light to handle, much of the advantage was lost because it was found necessary to use mechanical bending and straightening tools at corners. Crane long travel conductors are all of high conductivity steel of tee section. For the cranes in the casting, charging and stock bays the section is 4in by 4in by $\frac{1}{2}$in with 3in by $\frac{1}{4}$in copper boosters bolted to the vertical leg for the full length of the track. Collection is by cast iron shoes running on the horizontal top surface of the tee. The shoes are linked to a collector post on the crane, and rely on their own weight to make contact with the conductor tee. Steel tees are also used for the cross bridge conductors on all cranes, except a few of the lighter ones, where looped flexible cable is fitted.

The ends of all long travel conductors, remote from the incoming feeders, are connected by cables to a hand operated, off-load link board, to give interconnection between the conductors on all the gantries. These connections enable all cranes to be kept in service when either section of the power station d.c. board has to be isolated for maintenance work on the circuit breakers.

On all production cranes the motors are series wound and of the new A.I.S.E. standard 600 range. They are among the first of this type to be made in this country. The new type of motor has two main advantages over the older 400 range. The armature inertia is smaller, resulting in shorter reversal times, better thermal efficiency and higher safe speed. It is also smaller in size for the same horse power, a matter of growing importance on modern, high powered cranes. The motors have cast steel frames in two parts, heavy ball and roller bearings in cartridge housings, and an internal fan to circulate air inside the carcase.

Cranes on maintenance duties are fitted generally with industrial d.c. crane type series wound motors. Direct current was preferred for cranes, wherever possible, because of variable speed requirements, particularly on hoist motions.

On the long travel and cross traverse motions of all production cranes, particularly those where the unladen weight differed widely from the laden, careful consideration was given to the choice of suitable motor powers. This proved to be necessary to avoid, on the one hand, excessive motor speeds when running light and, on the other, overheating on frequent duty cycles.

For all drives other than cranes, and for cranes which are too far from the main d.c. load centre to warrant running supply cables, a.c. motors are used, from the 2,750 V supply for powers over 100 h.p., and from the 440 V system for smaller motors. The 2,750 V motors, driving pumps and fans, are direct-on-line started, with a starting current equal to $4\frac{1}{2}$ times full load current.

In all the main buildings, the lighting has been designed to give an average intensity of illumination of 6 lumens/sq ft, after allowing for a 5 per cent fall in output due to dirt and depreciation of the lamps. In the three bays of the melting shop, mercury vapour lamps are alternated with tungsten filament lamps, not only to improve the colour of the light, but also to maintain a reasonable illumination if the vapour lamps go out due to a voltage surge. The mercury vapour lamps are 1,000 W, 440 V, and give a light output of 48,000 lumens; the tungsten lamps are 1,500 W, 250 V, giving 28,000 lumens.

All the lamps are housed in anodized aluminium reflectors with side vents to give cooling and some upward light. The vents also promote a flow of air through the reflectors, which assists in keeping the reflector surface clean. To supplement the light on the casting bay floor, angle reflectors, housing 1,000 W tungsten lamps, are provided on the crane access gangway opposite the furnaces. Maintenance shops and other ancillary buildings are equipped with vitreous-enamelled reflectors, each housing a 750 W tungsten and a 400 W mercury vapour lamp, spaced to give an average intensity on the floor of 6–10 lumens/sq ft.

All lighting fittings in the roofs of main buildings are mounted on horizontal pivots, the bearings of which are bracketed to the handrailing of catwalks which run the full length of every building. The reflector assembly is held in position by a spring clip on the bracket, and balanced by a counterweight on an arm at the opposite side of the pivot. To clean the reflector or replace a bulb, the lamp can be swung upwards, within easy reach of a man standing on the catwalk.

Lighting of railway sidings is given by clusters of lamps on six steel masts, 150ft high. Each mast has a platform 8ft square, designed to accommodate up to 48 1,000 W tungsten filament floodlights. The intensity of illumination will, of course, vary, but the masts have been sited to give the greatest intensity, about 1·5 lumens/sq ft, around the groups of railway switches at the ends of the sidings. Two types of cover glasses are fitted, to give either a concentrated or a dispersed beam.

An internal automatic telephone exchange, with an initial capacity of 100 lines, but capable of being extended to 1,000 lines, has been installed at the Lackenby works. Similar exchanges are already in operation at the adjacent Cleveland and Redcar works, and the laying of power cables between the three works provided an opportunity of linking them with a 20-pair telephone cable. The tie lines between these works will be of great value to the respective managements, and particularly to the traffic departments, in controlling the movement of hot metal and ingots. The internal automatic system is entirely independent of the G.P.O. service.

Industrial Fuel Efficiency

PARTICULARS of "The Four-Way Service of N.I.F.E.S." are given in a 12-page illustrated booklet obtainable from the National Industrial Fuel Efficiency Service, 71, Grosvenor Street, London, W.1. This body is a non-profit-making company (financed by the National Coal Board, the British Electricity Authority and the Gas Council), which as from 1st May took over and expanded a similar service given by the Ministry of Fuel and Power since 1942. Sir Leslie Hollingsworth is chairman of the board of directors, who include Sir John Hacking, M.I.E.E., lately Deputy Chairman (operation) of the B.E.A. The chief executive is Dr. W. A. Macfarlane, F.Inst.F. The booklet outlines the four types of service available. Code 1 provides a "first-aid" cost-free inspection of a plant leading to detection of the more obvious sources of waste. Code 2 deals with operational improvements to secure maximum efficiency and may often avoid expenditure on additional plant. The fee charged is £5 per engineer-day (including the use of requisite instruments) amounting in all to an average of £25 for a report. Periodical inspections can also be arranged. Code 3, which covers inspection in detail, includes measurement of boiler efficiencies and of maximum and minimum steam demands with varying loads, indicating engines and estimating power plant performance in relation to loads on utilization plant.

Code 4 relates to a full heat and power survey giving a heat balance for all sections of a plant, with interim commentary and a fully documented report. As in Codes 2 and 3, the charge is £5 per engineer-day. This complete investigation could provide a basis for a consulting engineer to plan a reorganization or extension of a works plant, the aim of N.I.F.E.S. being to support and supplement all other organizations working soundly for fuel efficiency. A "fuel user's quiz" of 36 relevant questions is included.

A reduction of 20 per cent in fuel bills is believed to be attainable by most firms. Examples of savings made through improved fuel usage are given anonymously, since all information collected by N.I.F.E.S. engineers is treated as strictly confidential. Particulars of the Government's extended loan scheme for fuel saving equipment are briefly stated.

Measurement Conference

ALTHOUGH it has been decided not to hold the sixth International Mechanical Engineering Congress, which is sponsored in this country by the British Engineers' Association, until 1955, a *colloquium* on "Automation of Measuring" will be held in conjunction with the fourth European Machine Tool Exhibition at Stresa on 24th and 25th September, 1954. The "Automation of Measuring" is subtitled "An Approach to the Rationalization of Inspection" and it will consist essentially of an introductory paper by M. Dr. Inj. P. Leinweber, professor of the Technische Hochschule of West Berlin which will constitute an *aide-mémoire* and will serve as the basis for discussion on the subject selected as the theme for the meeting. Copies of Dr. Leinweber's paper can be obtained from the Association at 32, Victoria Street, London, S.W.1.

ELECTRICAL EXPORT PROSPECTS

Opportunities in Australia, New Zealand and Canada

By A. NEWING, M.I.E.E.

Mr. A. Newing is managing director of the Nevelin Electric Co., Ltd.

AFTER a nine weeks' tour of some 40,000 miles, taking in Australia, New Zealand, Canada and the United States, the writer is convinced that there are still considerable opportunities for British manufacturers to expand their Commonwealth trade. The growing tendency towards local self-sufficiency, however, coupled with increasing competition from other countries, inevitably results in a change in the pattern of development and lays particular emphasis on exports of high quality and highly specialized products in which this country excels.

Since the war Australia has been determined to make itself self-sufficient and to-day 41 per cent of the population is in secondary industries. Nearly every electrical device is now made there—not competitively with British manufacture but much more competitively than one might have thought possible. Nevertheless, with a working week of only 40 hours, three to four weeks' holidays and wages equivalent to £16–£18 in that country, the Australian producer finds it difficult, despite high freight charges, to compete with British manufacturers. On the other hand local buyers are prepared to pay 10 per cent more for locally made goods and manufacturers have the benefit of having available from the huge up-to-date plant at Newcastle (N.S.W.), probably the cheapest steel in the world. The locally produced electrical sheet steel, while more expensive, is quite up to the standard of British products. In other raw materials too Australia is self-supporting with the exception of oil and it is hoped that the favourable reports recently given may result in adequate local supplies.

Protective Tariffs

To overcome the differential in price between Australian and British made electrical products local manufacturers can apply for protection to the Import Tariff Board which makes its decision only after considering exhaustively evidence from all interested parties. To-day the import tariff averages around 27½ per cent but it may vary between 10 and 50 per cent.

In some cases the quality of Australian-made apparatus is not quite as good as that of British. In striving for self-sufficiency the Australian electrical manufacturer is a master of improvisation and produces a large number of components which in this country would be bought from specialist firms. His overhead charges too are probably only about half ours due to his elimination as far as possible of unproductive work. For this reason it is unusual to prepare detailed drawings of apparatus, it being left to the innate self-reliant spirit of the workers to translate the basic designs into practice. By and large there is very little basic development and manufacturers just take what has gone before and copy it.

There are now in Australia facilities for making high voltage transformers up to 30 MVA and motors up to 700 h.p., as well as switchgear and a full range of domestic appliances. It is possible, however, that for many years to come Australia will be two or three years behind us in design and will have to continue to import newly developed products and specialized components. Owing to the war, American influence has become increasingly noticeable and there is a tendency to regard the United Kingdom as old-fashioned in certain respects. It is very evident that not nearly enough people go to Australia from this country to see the sort of competition that has to be met.

Since the slump in wool prices two years ago there has been a big change and the country has emerged in a more chastened frame of mind. Now it is back to over 90 per cent of its former prosperity and one cannot fail to be enormously impressed with the future possibilities.

Conditions in New Zealand

New Zealand, a country of great beauty, presents a considerable contrast to Australia. It is intensely socialized (it claims to have invented our Socialist system) and practically everyone seems to earn between £1,000 and £2,000 a year. A five-day week is rigidly adhered to and there are no shops open on Saturdays or Sundays. Perhaps the most predominant impression is one of sameness. In view of the lack of encouragement to initiative, there is practically no local manufacture of electrical equipment, though what there is is strongly protected by partial if not complete prohibition of imports. With the probable continuance of comparative prosperity, however, there appears to be no reason why the market should not continue to be favourable to British exporters.

It is intensely interesting to note the contrast when travelling across America and Canada. Canada is definitely going ahead industrially and is now producing over 80 per cent of its electrical requirements. It has a high opinion of its own products, but inevitably there is a good deal of dependence on American ideas as well as financial resources.

British manufacturers' greatest opportunities lie in the cheapness of their products and their higher technical skill in certain specialized lines. A long term view is that if British electrical manufacturers want to expand in Canada they have to make arrangements for some local production, except in the case of highly technical goods, and a first class sales and service organization is essential. Nevertheless, opportunities still remain for the sale of British made goods to British firms establishing factories in Canada. It should be mentioned, however, that the cost of selling, as well as manufacture, in Canada is very high indeed. Wages are two and a half times what they are in this country and the long distances which have to be travelled add enormously to travel and freight costs.

After travelling through these countries, it would appear that both Australia and Canada are going to expand on an immense scale. Australia visualizes being able to support easily a population of 50 million while Canada contemplates adding very considerably to its population of 15 million by the development of its northern and western territories. New Zealand too has its possibilities though not on the same scale. All these developments point to an increasing demand for electrical equipment, in the supply of which British manufacturers can play an important part.

A.C. Motor Speeds

By "ROTOR"

Causes and Effects of Their Reduction

THE magnetic flux of a polyphase induction motor revolves round the machine at its synchronous speed N_s, equal to $\frac{f}{P}$ r.p.s., where f is the supply frequency and P the number of pairs of poles. The actual speed N r.p.s. of the rotor will be slightly less than the synchronous speed; the fractional slip is equal to $\frac{N_s - N}{N_s}$, and is negligible on no load. The fractional slip of an induction motor on full load normally varies from about 0·02 to 0·09, depending on the design of the motor.

Changed Frequency

It follows that the speed of an induction motor will be reduced if the frequency of the supply falls. Reduced frequency also increases the stator flux and the magnetizing component of the motor current, thus increasing heating due to increased I^2R and iron losses. Since the magnetic flux and magnetizing current fall somewhat as the load is increased, an induction motor on reduced frequency may run hotter on a fraction of its full load than on increased load.

Increased frequency, on the other hand, tends to reduce the stator flux and starting torque of a motor, and to reduce the pull of a.c. electromagnetic coils such as no-volt coils, contactor coils and brake coils. The consequently higher speed increases proportionately the h.p. output on a given load torque. For a centrifugal load the load torque may be proportional to the speed squared and the h.p. to the speed cubed, so the motor may overheat due to increased output.

Normally the frequency of alternators connected to the grid system is controlled to average out exactly over each 24 hours, but over short periods the frequency may differ slightly from the declared value. Quite slight reductions of motor speed, however, may cause appreciable trouble on some drives, such as looms in which the picking stick strikes the shuttle with a force proportional to the square of the speed.

Changed Supply Voltage

A motor automatically runs at a speed at which it develops a torque just equal to the resistance torque of the load. The motor torque is proportional to the product of the rotor current, stator flux, and the power factor of the rotor circuit. At a given frequency and rotor speed the slip frequency of the induced rotor current has a constant value, and the rotor can be considered to have a constant impedance and power factor. The rotor current will then be proportional to the voltage induced in the rotor conductors, this voltage being proportional to the product of the stator flux and the slip. Hence, at a given slip and a given supply frequency, the motor torque will be approximately proportional to (stator flux)^2.

As shown in Fig. 1, the stator current I_1 of a polyphase induction motor has three components: a small component I_L, which provides for the core losses of eddy currents and hysteresis; a component I_M, which provides the magnetic flux; and a component $-I_2$, which is required to compensate for the demagnetizing effect of the rotor ampere-turns. The magnetic flux produced by current in the stator windings has two components. First, the main component Φ, which crosses the radial air gap between the stator and rotor cores and is linked with the rotor conductors and is responsible for the voltage induced in the rotor conductors; and, secondly, the leakage flux, linked only with the stator windings, which is responsible for the leakage reactance of these windings. The voltage V applied to the stator windings is utilized in overcoming the voltage $-E_1$, which is self-induced in the stator windings by the linked flux Φ, and in overcoming the impedance volt drop $I_1 Z_1$ of the stator windings. The resistive volt drop $I_1 R_1$ is in phase with the stator current, whilst the reactive volt drop $I_1 X_1$ leads the current I_1 by a quarter of a cycle. The reactive volt drop is equal to $2 \times \pi \times f \times L \times I_1$, where L is the coefficient of self-inductance of the stator windings per phase due to the leakage flux.

If the voltage V applied to the stator windings of the induction motor is reduced the linked flux Φ will also be reduced. At a given speed the induced rotor voltage will be reduced in proportion to Φ, as will also the rotor current. Thus the component $-I_2$ of the stator current will be reduced practically in proportion to the applied voltage V. Neglecting the slight reduction of the core loss component I_L due to the reduced flux density, the stator current and the resistive and reactive volt drops will be practically proportional to the applied voltage, as will also the linked flux Φ and the self-induced stator voltage $-E_1$. Thus the motor torque, proportional to the product of stator flux, rotor current and rotor power factor, will be practically proportional to V^2, at a given speed. The reduced motor torque causes the motor slip to increase slightly, with increase of rotor voltage, rotor current, and

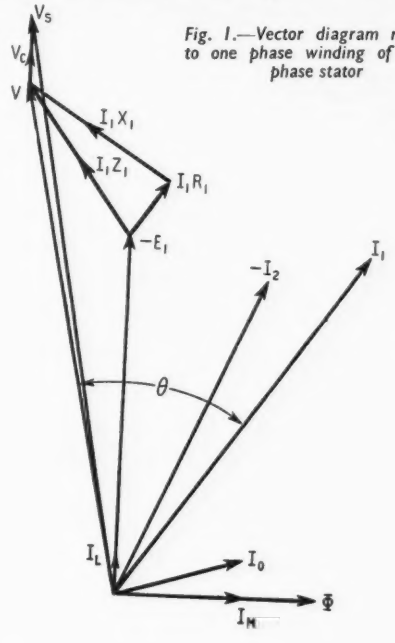


Fig. 1.—Vector diagram relating to one phase winding of three-phase stator

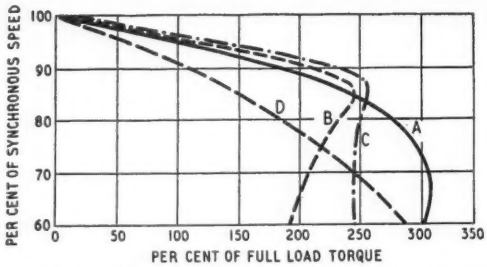


Fig. 2.—Speed-torque curves of typical squirrel-cage motors at normal voltage. (A) Standard cage. (B) High-reactance cage. (C) Double cage. (D) High-resistance cage

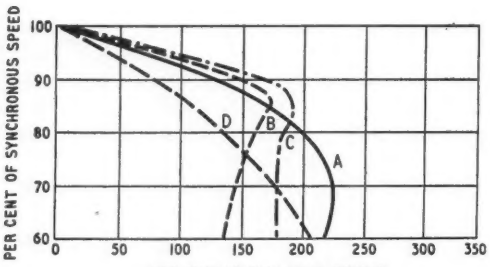


Fig. 3.—Speed-torque curves of typical squirrel-cage motors at 85 per cent voltage. (A), (B), (C) and (D) as for Fig. 2

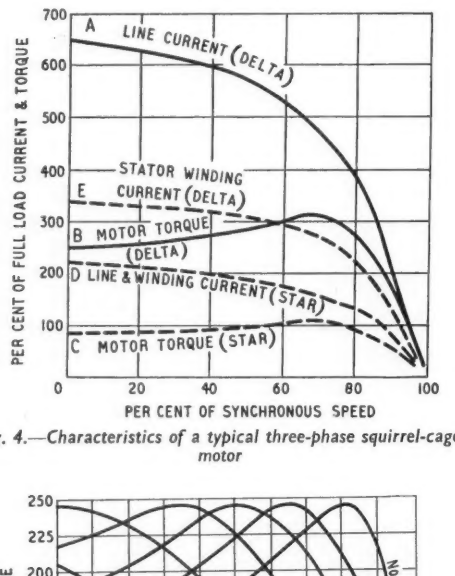


Fig. 4.—Characteristics of a typical three-phase squirrel-cage motor

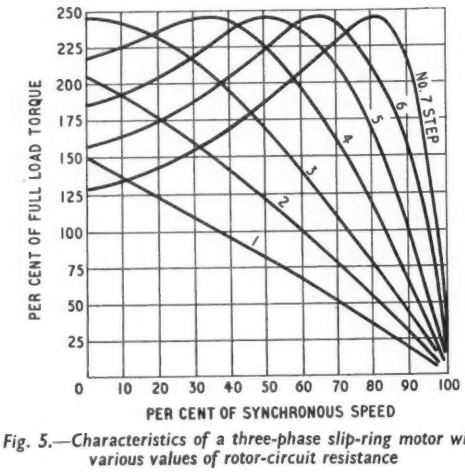


Fig. 5.—Characteristics of a three-phase slip-ring motor with various values of rotor-circuit resistance

torque, the motor speed becoming steady at a slightly lower speed at which the motor torque is once more equal to the load torque.

The extent of speed reduction due to a given reduction of stator voltage will depend on the design of and the load on the motor. Fig. 2 shows that the speed of a standard squirrel-cage motor on a given load is higher than that of a motor with a high-resistance rotor. Fig. 3 refers to the speed-torque characteristics of the motors on 85 per cent of normal stator voltage. These curves indicate that the drop in speed with a given fall of voltage is much more with high-resistance than with lower-resistance rotors.

Cable Volt Drop

Low voltage at the stator terminals may be due to excessive volt drop on the supply cables. In Fig. 1 V_s represents the supply voltage, and V_c the volt drop on the cables. Since the current taken by a motor to develop a given torque and horse power is increased when the terminal voltage is lowered, reduced supply voltage tends to increase the volt drop on the cables. High volt drop may be due to high reactance, as when single-core cables are used on a polyphase circuit, especially if widely separated and run near steelwork but is usually due to high-resistance of comparatively small cables.

Incorrect Connections

Motors sometimes run at reduced speed on normal supply voltage owing to incorrect stator winding connections. For instance, if a dual-voltage motor is run on the lower voltage with its windings connected in series instead of parallel the voltage per turn of the windings will have half the normal value. The windings would then be liable to overheat if the motor were used on more than about half the rated line current, since each coil would have to carry the full line current instead of half.

Similarly three-phase motors have run at reduced speed and overheated on load, due to their stator windings having been connected in star instead of delta. Fig. 4 shows that on 75 per cent of full load torque a motor may run at about 96 per cent of synchronous speed, depending on the design of the motor. The line-current input to the delta-connected motor may then be about 75 per cent of full load value, the current in each phase of the stator windings being about 44 per cent of the full load line current. On the other hand, if the stator windings are wrongly connected in star, the motor may run at 84 per cent of synchronous speed on 75 per cent of full load torque. At this speed the stator windings may take about 125 per cent of full load line current. Since delta-connected windings are designed to carry only $\frac{1}{\sqrt{3}}$ of the line current they would then be subject to about twice full load value and would overheat. Reduced speed may similarly be due to the starting operation not being completed, as in the event of a star-delta starter, or an auto-transformer starter being left in the starting position.

Overload

Reduced speed may also be due to overload. Fig. 2 shows that this will have the greatest effect in the case of an induction motor having a high-resistance rotor. An overload of 30 per cent may result in three times the reduction of speed compared with a standard motor. This difficulty was experienced with a batch of motors fitted with high-resistance rotors to obtain a high power factor without full consideration of the possible effect of the reduced speed on the driven plant.

A motor with a high-resistance rotor can, however, relieve itself of load to some extent by slowing down.

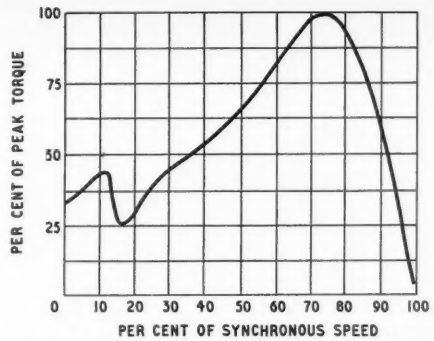


Fig. 6.—Effects of harmonics on speed-torque characteristics of squirrel-cage motor

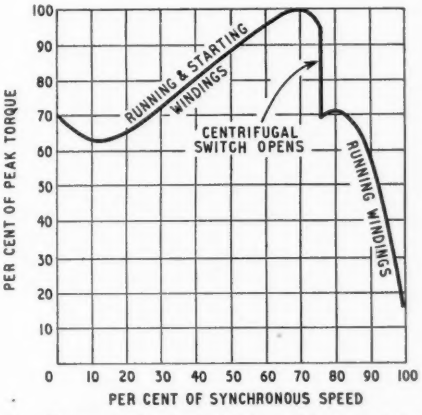

PER CENT OF PEAK TORQUE
RUNNING & STARTING WINDINGS
CENTRIFUGAL SWITCH OPENS
RUNNING WINDINGS
0 10 20 30 40 50 60 70 80 90 100
PER CENT OF SYNCHRONOUS SPEED

Fig. 7.—Characteristics of single-phase split-phase induction motor

This effect is useful when the motor is subject to peak overloads of high value and short duration, especially if a flywheel is incorporated in the drive. The flywheel will deliver energy proportional to $(N_1^2 - N^2)$ in slowing down from N_1 to N r.p.s. during the peak load, the motor speeding up the flywheel to restore its kinetic energy after the peak load has passed. The flywheel can be utilized to maximum effect in conjunction with a motor which has a high slip on overload.

Slip-Ring Rotor Circuit

Fig. 5 shows the speeds obtainable from a slip-ring induction motor on different loads with various values of rotor circuit resistance. Reduced speed may result from the rotor starter not having been moved fully over to the running position. It may also occur if the rotor resistors are not fully short-circuited due to burnt or badly adjusted starter contacts, faulty connections, or a rotor contactor having failed to close. Other causes are worn, sticking or badly adjusted brushes, rough slip rings, or faulty slip-ring short-circuiting contacts.

In some cases a slip-ring motor may be at a considerable distance from its rotor starter, resulting in an appreciable reduction of the motor speed due to the high resistance of the intervening cables. Unfortunately the rotor current is not marked on all slip-ring motors, and all electricians do not seem to appreciate that the rotor current may be greater than the full load stator current.

Speed may be low owing to increased rotor resistance through faulty connections, or cracked bars or end rings. A motor designed for more than one speed may have an appreciable slip on the higher speed obtainable with the

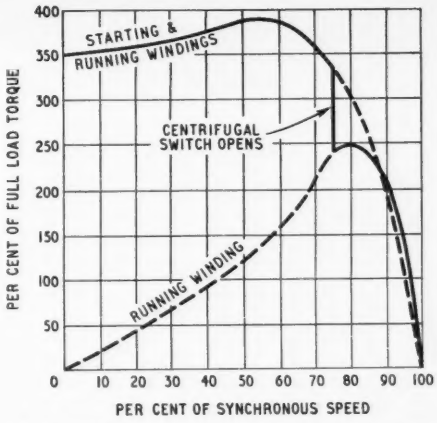

PER CENT OF FULL LOAD TORQUE
STARTING & RUNNING WINDINGS
CENTRIFUGAL SWITCH OPENS
RUNNING WINDING
0 10 20 30 40 50 60 70 80 90 100
PER CENT OF SYNCHRONOUS SPEED

Fig. 8.—Speed-torque characteristics of a capacitor-start-induction motor

smaller number of poles, since the effective resistance of the rotor end rings is inversely proportional to the square of the number of poles.

Crawling of Induction Motors

A motor may tend to crawl at a very low speed due to harmonics produced with a particular combination of stator and rotor slots. Fig. 6 shows how this may result in a reduced torque at a low speed. This effect may be of little importance if the motor starts on low load, but if the starting load is increased or the motor torque is reduced by low voltage, the motor may fail to accelerate past a certain speed.

Single-Phase Motors

Owing to non-sinusoidal flux distribution in the air gap of a single-phase induction motor the motor torque is reduced at one part of the speed-torque characteristic, as indicated in Fig. 7. This may result in crawling at a low speed if the design is faulty, the starting load is high, or the motor torque reduced due to low voltage.

A capacitor motor may run at a slightly reduced speed through using the wrong value of capacitor. Fig. 8 refers to the speed-torque curve of a capacitor-start motor, which shows that, if the centrifugal switch fails to disconnect the auxiliary winding and condenser at starting, the motor may run at slightly less than normal speed with both stator windings energized. A similar reduction of speed of a capacitor-start-and-run (two-value) capacitor motor may

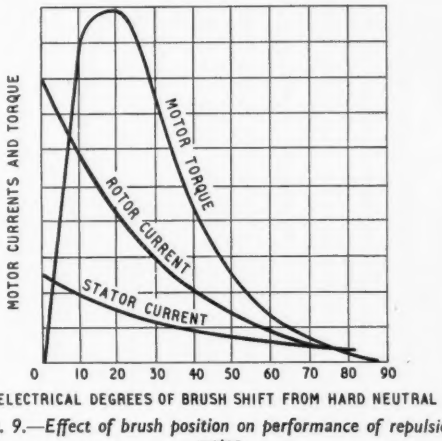

MOTOR CURRENTS AND TORQUE
MOTOR TORQUE
ROTOR CURRENT
STATOR CURRENT
0 10 20 30 40 50 60 70 80 90
ELECTRICAL DEGREES OF BRUSH SHIFT FROM HARD NEUTRAL

Fig. 9.—Effect of brush position on performance of repulsion motor

occur in the event of the starting operation not being completed due to non-operation of the centrifugal switch or otherwise. In both cases the short-time rated starting capacitor, and the starting windings, are likely to be damaged very quickly.

A series motor is likely to run at much less than normal speed if the applied voltage is low, through low supply voltage or a resistor being left in circuit. Reduced speed may also be due to incorrect brush position, overload, faulty contact between the brushes and commutator, open-circuit, short-circuit, or earth fault in the windings.

The brush position of a repulsion motor is very critical. As may be seen from Fig. 9, a slight change of brush position may cause a considerable reduction of motor torque, and hence of the motor speed on a given load torque. Short circuits in the rotor windings of a plain repulsion motor, and sometimes of a repulsion-start-induction motor, may also reduce the motor speed on a given load. An earth fault on the rotor windings may have a similar effect if the brushes are not insulated from the motor frame.

A repulsion-start induction motor will operate only as a repulsion motor if the centrifugal device fails to short-circuit the commutator at the critical speed and leaves the brushes in contact with the commutator. In this case the motor speed may vary considerably on a varying load, as shown by the curve A in Fig. 10, with reduced speed on overload and increased speed on reduced load. If the centrifugal device raises the brushes from the commutator at the critical speed without short-circuiting the commutator, due to faulty contacts or otherwise, the motor may hunt round about the critical speed.

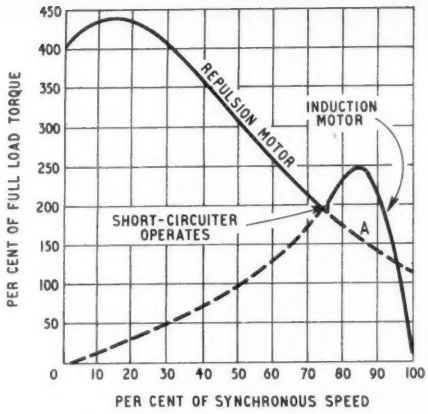


Fig. 10.—Speed-torque curves of repulsion-start induction motor

Large New Zealand Scheme

The Roxburgh hydro-electric scheme on the Clutha River in the South Island is New Zealand's biggest hydro-electric scheme which with associated works will cost about £20 million and have an ultimate output of 320 MW. Recently the contract was reorganized and the Swiss firm involved has agreed to pay the Government £200,000 in compensation for delays. In the reorganization a New Zealand firm will be placed in charge.

An aerial view of the Roxburgh dam site showing where the Clutha River will be diverted

Austrian Hydro-Electric Development

Possibilities for British Manufacturers

By R. E. KAAN, Dipl. Ing.

OF Austria's huge water power resources, estimated at about 40,000 million kWh per annum, only 5,500 million kWh per annum has been developed; the equivalent of 2,500 million kWh is under construction and a further output of 24,000 million kWh is planned. When the schemes now under construction have been completed, only one-fifth of Austria's potential resources will have been used.

Because of the geological formation of the Alps, development of water power in Austria has been more difficult and expensive than in Scandinavia. Faced with an ever-growing demand for more power by her industries, mostly situated in the eastern part of the country, and handicapped by an inadequate supply of coal, the authorities have resolved to overcome geological disadvantages and embark on a large-scale expansion of hydro-electric schemes, especially as excellent possibilities exist of exporting surplus power to neighbouring countries. Fig. 1 shows the capacity of Austrian hydro-electric schemes to be completed by 1955 in relation to undeveloped resources and neighbouring countries' developments are also given. The black sectors of the circles, drawn to scale, represent hydro-electric schemes due to be completed by 1955; the blank sectors show future possibilities.

Since the obvious practice is to use the most economical hydro-electric sites first, Austria is in a more favourable position regarding her undeveloped schemes than her neighbours, whose developments are more advanced.

Austria's projected hydro-electric schemes are shown, according to provinces, in Fig. 2, based on a future consumption of 2,500–3,500 kWh per head of the population as against 500–1,600 kWh at present. While electricity consumption in the most industrialized areas of Vienna and Styria will exceed the present output, the remaining six electricity boards will have a surplus thus enabling them to "export" power by means of the grid.

The development of the, as yet, unexploited resources of the most western provinces (Tyrol and Vorarlberg) and the prospect of supplying France with up to 2,000 million kWh a year, have stimulated interest in the neighbouring countries of Switzerland, Western Germany and Italy as well as the Benelux countries, where industrial power demand has outstripped the production of coal. Switzerland is interested mainly because power transmission lines to France would have to pass through her territory.

To co-ordinate these plans, an international study group ("Interalpen") comprising Austrian, West German, French and Italian electricity supply authorities was inaugurated in Innsbruck (Tyrol) in December, 1952. This comprises four subcommittees: hydro-technical, technical/commercial, juridical, and financial, with the purpose of solving all problems connected with the supply of cheap electric power to participating countries and determining the order of proceeding with the many power stations planned. The members of "Interalpen" agreed that the first stages of the following projects should be started: Bregenz (Vorarlberg) and Oetz and Dorfenthal (Tyrol). The developed capacity of these schemes will be shared equally amongst the four partners of the group.

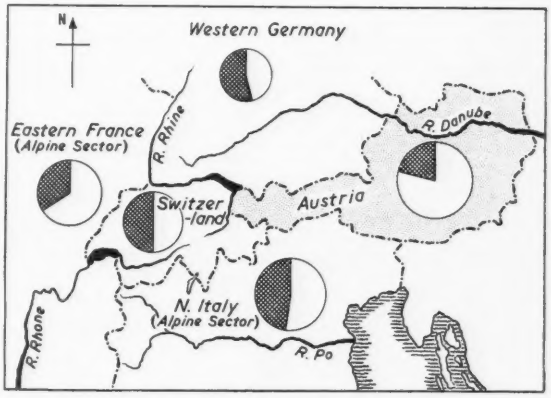
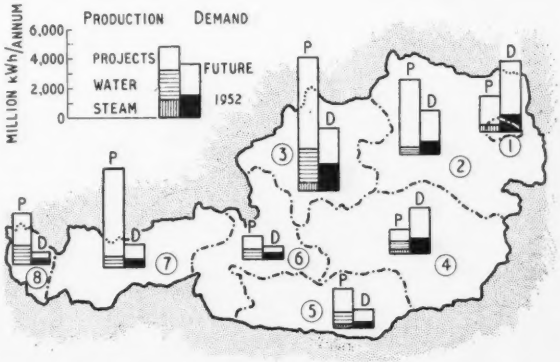


Fig. 1.—Alpine hydro-electric resources



Electricity Boards: 1. Vienna, 2. Lower Austria, 3. Upper Austria, 4. Styria, 5. Carinthia, 6. Salzburg, 7. Tyrol, 8. Vorarlberg

Fig. 2.—Austria's present and planned hydro-electric output and demand

Recent discussions in Vienna with representatives of the International Bank for Reconstruction and Development revealed the interest of the latter in all hydro-electric schemes proposed by "Interalpen."

After receiving an undertaking from the I.B.R.D. that a loan would be forthcoming for the development of the Reisseck Kreuzeck scheme in Carinthia (Southern Austria), a contract relating to power export was signed between the Austrian and Italian electricity authorities. The contract in its early stages provides for a small export from Austria to Italy, to be progressively increased after completion of the scheme to an ultimate 132 MW.

With the bulk of Austria's industry concentrated in Vienna, the huge Danube water-power scheme at Ybbs Persenbeug (Lower Austria) now under construction (output 3,000 million kWh yearly) gains an added importance and will go far to relieve the power shortage in Eastern Austria and Vienna itself.

Though most of the machinery and apparatus required for the various plants will be manufactured locally, mainly by the four concerns Siemens, A.E.G., B.B.C., and Elin, there should be openings for United Kingdom manufacturers, particularly now that Austria's import restrictions have recently been relaxed with prospects of further liberalization. The market will mainly consist of highly specialized plant and material, diesel generating sets, scientific instruments and, as a result of the growing electrification of the country, electrical household appliances where the home demand cannot at present be met by local manufacture.

NEW BOOKS

Modern Electroplating. Edited by Allen G. Gray. Pp. 563; figs and index. Chapman and Hall, Ltd., 37, Essex Street, London, W.C.2. Price 68s.

Without doubt this book is the most useful, complete and important one yet compiled on the subject of electroplating. It is a new edition of the volume published under the same title by the Electrochemical Society (U.S.A.) in 1942. Each chapter is written by one or more experts in the particular subject and each has been almost completely re-written since the original edition in order to bring it right up to date and also to condense and simplify the subject matter. With this re-writing the whole volume has been given a very satisfactory uniform style and in spite of the completeness of the treatment of each subject, the whole volume is very easy to read.

The opening chapters on general principles, methods of control and alloy plating are a valuable introduction to the remainder of the book which deals chapter by chapter with all the metals which are capable of being electrodeposited—from brass and copper to zinc and uncommon metals. The final chapter deals with plating on aluminium and magnesium—the latter a very recent development. The space devoted to each chapter is well proportioned to correspond to the relative commercial importance of each metal in electroplating and allows sufficiently detailed consideration of all the important commercial plating processes.

The volume is written mainly from the point of view of the electrochemical and chemical aspects of plating processes and hardly deals at all with plating plant or electrical equipment for plating, except for occasional references when a particular process necessitates some novel equipment. However, for those who are responsible on the technical side for running or planning plating departments this book will be invaluable; this also applies to those who already possess a copy of the 1942 edition, for they will find the new edition still more valuable than they found the old.—S.W.B.

Crystal Rectifiers and Transistors. Consulting editor, M. G. Say. Compiled by E. Malloy. Pp. 170; figs. and index. George Newnes, Ltd., Tower House, Southampton Street, London, W.C.2. Price 21s.

The latest addition to Newnes "Electrical Engineering Progress Series" is, by present standards, a comparatively modestly priced book intended, to quote the preface "to give the electrical engineer an up-to-date survey of the present state of the art." The assiduous collector of manufacturers' literature will obtain little new information from it, as it consists almost entirely of a collation of catalogue data: this is not to decry its usefulness, however, as this is probably the first time that data on every crystal device at present generally available has been assembled in such a convenient form.

An elementary description of rectifier and transistor action is followed by a chapter on electrical characteristics, physical dimensions and some applications (chiefly microwave) of silicon diodes, and a similar chapter on germanium point contact and junction diodes, with a variety of applications. A chapter on point contact transistors contains data on current models, also descriptions of some apparently obsolete and experimental constructions. Junction transistors are very fully covered in the following chapter. The testing of transistors receives 19 pages; a lengthy discussion of the phototransistor is followed by characteristics of the currently available type.

The final chapter is devoted to transistor circuitry, and illustrates both the simplicity of transistor circuits, and the necessity to remember that, in contrast to the thermionic valve, the transistor is a current-operated device, and that therefore the biasing current is usually to be held constant, rather than a voltage. A straightforward transistor-for-valve substitution in a push-pull output circuit is described, but it is surprising that no mention is made of the property of complementary symmetry, which enables one to construct a two-stage push-pull amplifier without input or output transformer or the need for phase inverting circuits, especially as matched p-n-p and n-p-n junction transistors for this type of application are very fully described in an earlier chapter.—P.L.D.

Introductory Circuit Theory. By Ernst A. Guillemin. Pp. 550; figs. Chapman & Hall, Ltd., 37, Essex Street, London, W.C.2. Price 68s.

A textbook which is lucid and at the same time extremely readable is as rare as it is valuable. Dr. Guillemin's latest book on circuit theory is both, and also contains many humorous expressions and explanations. The methods and philosophy used in network analysis and synthesis are presented in well-graded chapters so that they may be followed by the undergraduate or practising engineer.

Electrical equivalent networks—and it is stressed that no physical component has "pure" resistance, inductance or capacitance—are first considered from the geometric point of view. They are manipulated to portray the concepts of loop currents, nodal voltages, and the principle of duality. The equilibrium equations of Kirchhoff and others are expounded and various methods shown for the systematic solution of these equations, including a very pleasant introduction to the methods of matrix algebra. The behaviour of simple circuits when subjected to impulse and step functions is discussed at some length, and accent again given to the principle of duality. The sinusoidal steady-state condition of networks is presented as a particular example of circuit response. Power and energy relationships in networks are essentially quadratic functions and a whole chapter is devoted to their study. Impedance and admittance are expressed in terms of these energy functions. The last three of the ten chapters of this book are used to formulate the generalization of circuit equations and energy relationships, giving further consideration to mutual inductance, driving point and transfer impedances, and matrix algebra. Each chapter is liberally supplied with illustrative examples and problems.

Although this book may be of more direct use to those engineers concerned with electronic and communication circuits, its subject matter forms the basis of all electrical engineering.—K.W.W.

BOOKS RECEIVED

Power System Transients. Edited by E. Openshaw Taylor. Pp. 176; figs. and index. George Newnes, Ltd., Tower House, Southampton Street, London, W.C.2. Price 21s.

The Repair of the Small Electric Motor. By K. Wilkinson. Pp. 180; figs. 98; index. E. & F. N. Spon, Ltd., 15, Bedford Street, London, W.C.2. Price 20s.

Ferromagnetic Domains. By K. H. Stewart. Pp. 176; figs. 70; index. Cambridge University Press, Bentley House, 200, Euston Road, London, N.W.1. Price 25s.

VIEWS on the NEWS

By REFLECTOR

I SUPPOSE that every section of the electricity consumer population thinks that it is subsidizing the others—at least that is the impression I have gained from many reports. Industrialists say that domestic charges are not high enough to carry their fair share of costs and domestic consumers point to the lower average charge to industry as proving that they are paying too much. But it is in the matter of rural electrification that most of the arguments occur. Farmers complain of the heavy charges imposed upon them for a supply of electricity both by way of capital contributions and guaranteed consumption. Urban consumers maintain, however, that (as usual) farmers are being favoured by way of hidden subsidy and are not bearing the full cost of their supplies. The point was raised again at a meeting of the Midlands Electricity Consultative Council last week when Councillor H. Clowes, of Stoke-on-Trent, complained of a general tendency to lower rural area tariffs and increase those in industrial areas. He thought that the extra cost of rural supplies should be met from the national exchequer and not charged to other classes of consumer. The Councillor's remarks were regarded as misleading by a Ross-on-Wye representative who contended that the supply to farms was now economically sound. This supports what a Southern Electricity Board man told me at the recent Royal Show at Windsor. It all depends, of course, upon the use which is made of the supply. Too often in the past farmers wanted lighting only, but now thanks to the strenuous work of the Board's agricultural representatives the many other benefits of electricity on the farm are being appreciated.

* * *

The Southern Sea Fisheries District Committee have drawn up a by-law (for approval by the Ministry of Agriculture and Fisheries) prohibiting the use of electricity in fishing in the district without the Committee's consent. One member considered that electric fishing could be "very dangerous or very useful"; no harm was done to small fish, shrimps, etc. He said (as reported by the *Bournemouth Daily Echo*) that

> "a.c. current brought breakages and dislocations in the fish. After a month or so trout were completely rigid, unable to feed themselves and died. D.c. current was not effective."

Mentioning developments in America and Germany, the chief fishery officer considered it advisable to ban electric fishing altogether.

* * *

There is much sympathy for old age pensioners and others whose incomes have an ever-decreasing purchasing power. But only State action can improve their position; it is virtually impossible for commercial concerns to discriminate between pensioners and other customers. This was touched upon by Alderman W. J. Bennett, chairman of the Eastern Electricity Consultative Council, at a recent Council meeting. I think, however, that Alderman Bennett went a little far (if he has been faithfully reported) when he said "We have not reached the stage where electricity is a social service." He no doubt meant "free" social service because it has always been the claim of the electricity supply industry that its activities are something more than commercial. And are not electricity showrooms nowadays called "Service Centres"?

* * *

One important justification of rural electrification is that it tends to keep men "on the land"—an important point when the tendency is a drift towards towns. Yet it was complained at a recent meeting of the Southern Electricity Consultative Council that while farms were being electrified agricultural workers' dwellings were being neglected. As one member put it:—

> "You sometimes find that the cowshed is supplied with electricity but the cowman's cottage is not."

I do not suppose that this is general but it certainly doesn't seem proper to pamper animals (if electric milking is thus regarded by the cows) and neglect their keepers.

* * *

In the *Electrical Review's* leading article of 30th July it was urged that retailers of electrical goods should show clearly and unambiguously exactly what the cash and hire-purchase terms were for each article they displayed. It is consequently gratifying to read in the *Economist* that advice on these lines has been given by the representatives of the big stores:—

> "It is suggested that the department stores should make a principle of stating clearly the price charged. That implies a clear statement both of the cash price and what the customer has to pay on hire-purchase—not merely the down payment and the amount of each instalment but also the number and frequency of instalments, or a statement of the balance to be spread over instalments."

It is to be hoped that this advice will be acted upon by all retailers both large and small.

* * *

At a meeting of the North British Association of Gas Managers reported in the *Electrical Review* of 2nd August, 1884, the president (Mr. F. T. Linton) said:—

> "How far other sources, and notably electricity might come into use as competitors for illuminating purposes with coal gas they need not discuss. The hard logic of facts had shown how impossible it was for electric lighting to compete commercially with gas, and it was difficult to conceive any probability of those circumstances being materially altered."

But having said this, Mr. Linton showed how in those very early days the two industries acted as spurs to one another, a competition which is still needed to-day in spite of the protests which are often heard. The report went on:—

> "It seemed to him that gas manufacturers who were threatened, somewhat jubilantly on the part of some people, with the total extinction by electric lighting were, after all, those whom it had chiefly benefited. They must confess that it was largely due to the threatened competition by electric lighting that their profession had been thoroughly roused from a condition of use and wont to one of activity and progress, and that spirit of inquiry induced which had already led to such beneficial results."

PERSONAL AND SOCIAL

News of Men and Women of the Industry

THE Secretary of State for Scotland announced in the House of Commons on 29th July that it was his intention to appoint **Mr. J. S. Pickles** to be the chairman of the new South of Scotland Electricity Board and **Sir Norman Duke** as deputy chairman.

Mr. J. S. Pickles, B.Sc., M.I.E.E., J.P., is at present chairman of the South West Scotland Electricity Board, a position to which he was appointed when the electricity supply industry was nationalized in 1948. He was born at Todmorden, Yorks, in 1898 and was educated at Manchester University. From 1921 to 1931 he held various positions with the Yorkshire Electric Power Co. and he then

Mr. J. S. Pickles

Sir Norman Duke

became county electrical engineer of Dumfries, remaining in that post until 1948. Mr. Pickles was president of the Incorporated Municipal Electrical Association in 1946; he has been a member of the I.E.E. Council and author of two I.E.E. papers—"Rural Electrification" (1937) and "The Use of the Single-phase System" (1947).

Sir (Robert) Norman Duke, K.B.E., C.B., D.S.O., M.C., B.A., has been chairman of the South East Scotland Electricity Board since 1948. He was born at Brechin (Angus) in 1893 and went to Corpus Christi College, Oxford, from Merchiston Castle School, Edinburgh. From 1919 to 1948 he was at the Scottish Office, apart from service with the Air Ministry in 1942-43 and the Ministry of Fuel and Power in 1944-45.

The Governors of Heriot-Watt College, Edinburgh, have conferred an honorary fellowship upon **Mr. W. B. Laing,** M.I.E.E., director and general manager of Bruce Peebles & Co., Ltd. This award, initiated in 1951, has for its primary purpose the encouragement of original work in those branches of study at present recognized for the associateship of the College. In special circumstances the fellowship may also be conferred "honoris causa" on persons distinguished in science or engineering, who have been associated with the College. Mr. Laing received his technical education at the College, taking the diploma in electrical engineering in 1922.

He served as a student apprentice with Bruce Peebles and was for a number of years chief of the rotating plant sales department. In 1943 he was appointed manager of the rotating plant department, and in 1952, a joint general manager, director in the same year, and general manager in 1953. Mr. Laing is a vice-chairman of the South-East Scotland Sub-Centre of the I.E.E.; chairman of the Electrical Industries Benevolent Association's Edinburgh Branch; and a past-president of the Edinburgh Electrical Society.

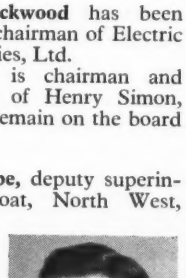
Mr. F. W. Aries, A.M.I.C.E., at present second assistant engineer (civil) in the Generation Construction Department of the South Western Division of the British Electricity Authority, has been appointed senior assistant engineer (civil) in that Department with effect from 1st August.

Mr. G. P. Bridges, A.M.Inst.C.E., L.R.I.B.A., M.I.Struct.E., manager of the Building Department of Simon-Carves, Ltd., has been appointed a director of the company.

Mr. J. F. Lockwood has been appointed deputy chairman of Electric & Musical Industries, Ltd.

Mr. Lockwood is chairman and managing director of Henry Simon, Ltd., and he is to remain on the board of that company.

Mr. E. B. Thorpe, deputy superintendent at Huncoat, North West, Merseyside & North Wales Division, B.E.A., since 1952, has been appointed station superintendent at the new Fleetwood station now under construction; the effective date of the appointment has yet to be arranged. Mr. Thorpe, who is forty-one years of age, has served in many capacities since entering the electricity supply industry in 1930 as test department apprentice with the Huddersfield Corporation Electricity Department. From 1937 to 1950 he served at various stations, including Kearsley, Radcliffe and Padiham. In 1950 he became operation engineer with Simon Carves, Ltd., engaged in commissioning and operating new boiler plant.



Mr. E. B. Thorpe

A number of changes in the Government were announced last week. From the electrical point of view, the most important one was the resignation by **Mr. Oliver Lyttelton** of the post of Colonial Secretary, to which **Mr. A. T. Lennox-Boyd** has been appointed. The latter is succeeded as Minister of Transport and Civil Aviation by **Mr. J. A. Boyd-Carpenter,** Financial Secretary to the Treasury. **Mr. A. R. W. Low** has become Minister of State, Board of Trade (vice Mr. Heathcoat-Amory who is now Minister of Agriculture), and his place as Parliamentary Secretary to the Ministry of Supply is taken by **Sir Edward Boyle.**

Mr. Oliver Lyttelton

Before becoming Colonial Secretary in 1952 Mr. Lyttelton had been chairman of Associated Electrical Industries, Ltd., for seven years; he succeeded Sir Felix Pole in 1945. It is generally believed that he will resume that position.

Mr. H. J. Mellows, F.C.I.S., F.A.C.C.A., chief accountant of the London Electricity Board, is retiring in October after 43 years in the electricity supply industry. The Board has appointed as his successor, **Mr. A. N. Todd,** A.C.A., who is at present an assistant chief accountant with the British Electricity Authority.

New directors have been appointed to the boards of **Austinlite, Ltd.,** and **Sumo Pumps, Ltd.,** the two English subsidiaries of Stone-Chance, Ltd., a new company incorporated on 27th May last and itself a subsidiary of J. Stone & Company (Holdings), Ltd. Stone-Chance, Ltd., was formed to take over the engineering interests of Chance Brothers, Ltd., after their purchase by J. Stone & Co. (Holdings). The directors of Austinlite, Ltd., are now Messrs. J. Raymond, F. W. G. Beaumont, L. B. H. Hallett and N. A. W. Stacey, and the directors of Sumo Pumps, Ltd., Messrs. J. Raymond, T. O. Orr, F. W. G. Beaumont, L. B. H. Hallett and N. A. W. Stacey. All except Mr. Raymond are new directors appointed

rom the management of the ompanies. Mr. Raymond, who is anaging director of Stone-Chance, td., has been on the board of these ubsidiary companies for the past ten ears. The other directors of Stone-Chance, Ltd., are Messrs. B. Preston chairman), A. J. S. Brown and P. A. eterson.

On 24th July Viscount Leverhulme resented prizes and gave an address n the occasion of the speech day of he **Royal Commercial Travellers' chools,** at Hatch End, Middlesex. eports were made by the headmaster Mr. L. L. S. Lowe) and the head-istress (Miss I. A. Crockett).

Mr. John Hilton, O.B.E., M.I. lech.E., and **Mr. C. D. H. Webb,** ssociate I.E.E., A.I.Mech.E., have en appointed executive directors of e Plessey Co., Ltd.

Mr. Hilton, who was formerly chief gineer of the Hoffmann group of mpanies and director of Hoffmann weedales, Ltd., joined the Plessey o. in 1949, and was appointed general nager of the Aircraft Mechanical ivision in 1951. Mr. Webb, who is neral manager of the Aircraft

Mr. J. Hilton

Mr. C. D. H. Webb

Electrical Division, joined the company in 1939 as senior design engineer, becoming deputy chief engineer in March, 1940. He was appointed general manager of the division in 1947, and later a director of Plessey (Northern Ireland), Ltd.

Mr. E. W. Connon, B.Sc.(Eng.), M.Eng., A.M.I.Mech.E., M.I.E.E., has been appointed to the new post of divisional electrical engineer of the North West, Merseyside and North Wales Division of the British Electricity Authority. Mr. Connon was educated at Aberdeen Grammar School and the Universities of Aberdeen and Liverpool and spent six years with the English Electric Co., commencing as a graduate apprentice and leaving as engineer in charge of the research laboratory in 1936. He then became electrical testing engineer to the North West Midlands Joint Electricity Authority and in 1944, when he was technical assistant, he joined the Sheffield Electricity Department as chief technical assistant. Upon the nationalization of the industry in 1948 he was appointed divisional technical engineer, Southern Division, B.E.A.

Mr. E. W. Connon

Mr. R. G. Braithwaite, M.I.C.E. (Braithwaite & Co. (Structural), Ltd.), was installed as president of the Institute of Welding at the annual general meeting on 20th July, in succession to Mr. A. Robert Jenkins. **Mr. R. E. G. Weddell** (W. G. Allen & Sons (Tipton), Ltd.) has succeeded Mr. Braithwaite as vice-president.

Mr. Philip H. Goddard retired at the end of July from the British Thomson-Houston Co., Ltd., after fifty-one years' service. Mr. Goddard joined the company in 1903, and after working in the Wiring Dept., Power House and Motor Factory, started a six-year course in the Test Dept. In 1913 he joined what was then known as the Supply Dept., later becoming power engineer first at the Newcastle-upon-Tyne District Office and later the Cardiff District Office. Subsequently he returned to Rugby and joined the Industrial Motor Sales Dept.

Mr. P. H. Goddard

Mr. Goddard served in the Army during the first world war and for many years he has devoted considerable time to public service. He was on the Rugby Borough Council from 1937 to 1950, and for six years he was chairman of the Rugby Electricity Committee; he also served on the Council of the Incorporated Municipal Electrical Association.

The South Eastern Area Final of the **Electrical Industries National Golf Championship** took place at Brighton on 23rd July; the winner was Mr. R. L. King (S.E. Electricity Board) and the runner-up Mr. C. L. Hills (Sangamo Weston). Mr. E. R. Wickens (S.E.E.B.) had the best scratch score. These Area winners will take part in the National Final at Moor Park on 4th October. An open competition in the afternoon resulted in a win for Mr. F. R. Thompson (G.E.C.), Mr. A. Rye (B.I.C.C.) being runner-up. Mr. King was presented by Sir John Dalton with the trophy bearing his name and Mr. Norman Elliott presented Mr. Wickens with the new "Seeboard" trophy. Sir John Dalton presided at a dinner at the clubhouse in the evening.

Employees of Societe Francais Des Procedes Oldham, the associate company in France of **Oldham & Son, Ltd.,** recently held their annual outing when they travelled from Arras to Hardelot, near Boulogne, as the guests of Sir Charles Henderson, the chairman of the French company.

OBITUARY

Mr. G. Farrar.—The death occurred on 26th July, while on holiday, of Mr. Gilbert Farrar, B.Sc. (Eng.)(Hons.), a commercial engineer in the Turbine Sales Dept. of the British Thomson-Houston Co., Rugby. Mr. Farrar was born at Putney, London, in 1889, and was educated at St. Paul's School and then at Chelsea Polytechnic where he obtained a London University honours degree. He joined the B.T.H. Co. in 1914.

Mr. C. S. Kent, C.B.E., a former manager of the "Times," whose death occurred on 30th July, was a director of Gresham Transformers, Ltd.

Mr. Randall Edgar Moore, sales representative of Foster Electrical Supplies, Ltd., died suddenly on 20th July. Mr. Moore, who was seventy-three years of age, joined the Foster organization in 1919 and was in the company's employment up to the time of his death.

WILLS

Mr. A. V. Sendell, chairman of the West of England Section of the Electrical Power Engineers' Association, a member of the N.J.B. and the District Joint Board for the Electricity Supply Industry, who died on 25th February last, left £4,852 gross (£4,462 net).

Mr. R. H. Holmes, assistant engineer, Eastern Electricity Board, who died on 6th May, left £1,873 gross (£1,716 net).

Mr. S. Haworth, sales superintendent of the Rossendale district of the North Western Electricity Board, who died on 28th February last, left £3,096 gross (£1,359 net).

Uganda Electrical Association

The United Kingdom Trade Commissioner at Nairobi has reported the formation of the Uganda Radio and Electrical Association, P.O. Box 28, Kampala, Uganda. The founder members of the Association are as follows:—Twentsche Overseas Trading Co., Ltd.; Gailey & Roberts (Uganda), Ltd.; B.E.A. Corporation, Ltd.; Motor Mart & Exchange, Ltd.; Kettles Roy & Tysons, Ltd.; Radio Service Co.; African Mercantile Co., Ltd.; and Assanand & Sons (Uganda), Ltd. The following are associate members: Department of Information; Uganda Broadcasting Service; British Insulated Callender's Construction Co. The aims of the Association are to provide a channel of communication between dealers and consumers, to guarantee service and quality from members of the Association and to investigate complaints of unsatisfactory service, and to encourage the wider use of electricity and radio by all possible means including joint publicity campaigns. It will not fix prices or control supplies. It intends to hold annual radio and electrical exhibitions and the first of these, claimed to be also the first radio and electrical exhibition held in East Africa, is being planned for Kampala next January.

PARLIAMENTARY REPORT

WHEN the Gas and Electricity (Borrowing Powers) Bill came up for second reading in the House of Lords on Monday, 26th July, Lord Hawke (Lord-in-Waiting) said that, with regard to electricity, it was estimated that by 1960 the maximum call under the most severe conditions would go up from 16·6 million kW to-day to 23·4 million kW, an increase of 6·8 million. The planned increase of generating capacity over these years was 9·8 million kW. After allowing for plant becoming obsolete, it was expected that this would result in nearly 8 million kW becoming available to meet fresh load.

On the other hand, at the end of 1953–54 we were 1·6 million kW short on maximum peak load. We could therefore expect by 1960 to reduce that maximum peak load deficit to something under 600,000 kW. The sum to be provided for transmission and generation was slightly less than half the total. The increase in generating capacity by 1960 was expected to involve the burning of 14 million additional tons of coal, bringing the total consumption of coal up to 50 million tons.

It was earnestly hoped that the coal would be there. But, in any case, the British Electricity Authority was examining the question of equipping certain power stations, particularly those in estuaries where it could get water-borne oil, with a dual apparatus to burn oil or coal, and there seemed a possibility of saving between 10 million and 11 million tons of coal in that way.

Their Lordships might wonder whether all those great capital works would be wasted when atomic power was developed. In the first place, that portion which went on distribution and transmission would, of course, certainly be required, and theoretically there was no reason why atomic steam-raising plant should not be coupled up to existing generators. In practice, however, it seemed that the atomic energy would become available probably at no greater pace than would be necessary to cater for the inevitable further increase in demand and to replace plant which was becoming out of date.

Moreover, if one were to assume—and he thought it was a fair assumption—that atomic plant would be very expensive in capital cost and would be used to run continuously to provide the base load, there would be plenty of scope for the existing power stations for years ahead to come in on the non-continuous load.

Roughly one-quarter of the generating capacity, running continuously, could provide about half the volume of current used, this being the base load, which was again about one-third of the peak load. The capital cost of the programme over the full 12 years from April, 1948, to 31st March, 1960, was estimated to be £2,121 million. Of that, £627 million was to be provided from internal resources and £75 million separately for Scotland, leaving £1,419 million. The existing borrowing power was £700 million. It was expected to be exhausted by Christmas. Hence the Bill in which the Government asked for the borrowing powers to be increased to £1,400 million.

Lord Wolverton said he was glad to see that provision was made in the Bill for setting up a special division of the B.E.A. to put atomic energy to useful purposes in the production of electricity, although they had a long way to go. Further borrowing powers were justified. From 1921 to 1948, when the electricity supply industry was nationalized, the industry spent £900 million on capital development. Between 1948 and 1952 it spent another £676 million, making a total of £1,576 million. During 1948–52 the industry provided from depreciation, trading profits and capital surpluses, because they sold some of their extraneous assets, a sum of £192 million, including a sum from depreciation alone of £182 million. The rest, £395 million, they had to provide by external borrowing.

The undertakings were not putting sufficient into general reserve. The whole prosperity of the industry during the next five years depended on its being able to plough back not only depreciation reserves but adequate general reserves, otherwise the industry might become over-capitalized, with too heavy borrowings and not enough internal reserves.

The Bill was read a second time, and was afterwards read a third time and passed.

V.H.F. Transmitters

Mr. McAdden asked the Assistant Postmaster-General on what frequencies the proposed British Broadcasting Corporation's very-high-frequency transmitters would operate; and what would be the capital cost involved.

Mr. L. D. Gammans said that these transmitters were expected to operate on frequencies in the range (known as Band II) from 88 to 95 megacycles per second; but the precise frequencies to be used for each station had not yet been settled. The B.B.C. estimated the capital cost of the first nine stations at £1¼ million.

Telephone Development

Mr. Hurd asked the Assistant Postmaster-General what was the average over the past five years of the investment in telephone development; what was the cost of the work in hand this year; and what the cost of the further development in prospect for next year would be.

Mr. L. D. Gammans, in reply, said that over the past five years the average investment on the telephone system, including renewals, had been £51·7 million; the estimated investment in the present financial year is £68·8 million and for next year £79·4 million.

Cable Makers' Assurance

Mr. Duncan Sandys, Minister of Supply, informed Mr. Erroll that the Cable Makers' Association and the Covered Conductors Association had given him an assurance that they would bring their arrangements into conformity with the Monopoly Commission's conclusions not later than 31st December next. That relieved him of the necessity of making an order under the Monopolies Act.

Batti-Wallahs' Society

The fascination of railways begins at an early age, and remains with most of us throughout our lives. The talk by Mr. C. J. Allen at last week's luncheon of the Batti-Wallahs' Society on railway speed records was, therefore, a popular one, and brought back memories of one's early days. Despite the more favourable conditions for high speeds in America and on the Continent it was interesting to learn that Great Britain still holds the record of 126 miles per hour for steam locomotion, and, as Mr. Allen pointed out, with the modern trend towards other forms of locomotion, as diesel, diesel-electric and "straight" electric, this is a record which is not likely to be beaten. As Mr. Allen indicated, higher speeds have, of course, been achieved by electric traction, particularly in France where a record of over 150 miles per hour has been attained.

Portuguese Station Inaugurated

The new Cabril power station in Portugal on the River Zezere, which was very briefly described in the *Electrical Review* of 11th June, was officially inaugurated on 31st July by His Excellency General Francisco Higino Craveiro Lopes, President of the Portuguese Republic. The generating plant and switchgear have been supplied by the two British companies, the English Electric Export & Trading Co., Ltd., and Metropolitan-Vickers Electrical Export Co., Ltd., acting together and known in Portugal as the "British group."

Bergen-Oslo Electrification

The *Railway Review* reports that the first section of the Bergen-Oslo railway to be converted from steam to electric traction has recently been officially opened by Mr. H. E. Stokke, Director General of the Norwegian State Railways.

INDUSTRY AND THE HOUSE

Television Bill Arguments

By A. M. F. PALMER, A.M.I.E.E., M.P.

SHOULD the excitements of the House of Commons all Members have always the privilege of strolling along the "other place" and hearing their Lordships in dignified argument. Such an opportunity was provided on Thursday last week when the House of Lords gave a third Reading to the Television Bill. In moving it Earl de La Warr, the Postmaster General, said Parliament had reached the last stages of a long controversy. The Government had sometimes been a little sad about what they had felt to be the rather "arrogant sense of superiority" on the part of some of those opposing the Bill, but their sincerity had never been in question. They had tried to meet every reasonable fear, including many they often thought were imaginary, in view of the traditions of British trade and commerce.

Criticisms of the Bill

Viscount Hailsham, better known at one time as Mr. Quintin Hogg, M.P., is among the ablest of the Conservative critics of the official television policy, and a particularly painful thorn in the side of the Government. On this occasion he told the Lords that his opinion on the merits of the proposals was as condemnatory as ever. A disservice to British radio had been done by introducing the Bill; its integrity and efficiency had been undermined. Lord Waverley, another Conservative doubter, was, however, more conciliatory than Lord Hailsham. He said he recognized that the Government had sought to meet the arguments of its opponents in many respects; a number of improvements had certainly been made. It was to be hoped the Government would take every care in bringing the new plan into operation and would do nothing which would make it difficult to think again if experience should show that changes were still required.

Winding up for the Labour Opposition, the former Lord Chancellor, Earl Jowitt, made the classical complaint of Opposition leaders—as he was reminded later—at this time of the parliamentary year. He said the circumstances in which the Bill had been brought before them made it impossible for the House to do its work efficiently. Why could the Bill not have been postponed until next session, so that their Lordships could have proper time to examine it? It was intolerable that a Bill had to be pushed through by the end of July, come what may. Lord Jowitt concluded on a last sad note of resignation; he trusted his worst fears would not prove to be true, and that the measure when it became law would not lower the whole standard of television.

Lord Salisbury, replying to the debate, admitted there had been congestion of business, but argued that it was at present a general weakness of parliamentary affairs. All parties should explore the problem and if some remedy could be found then the difficulties which had occurred over the Television Bill would not have been valueless.

Later the Lords' television amendments were debated by the House of Commons, as is the normal practice. One amendment provides that the Committee to judge standards of conduct in advertising should advise also on misleading advertisements. Mr. Douglas Houghton, the Labour Member for Sowerby, moved a supplementary amendment designed to broaden the basis of consultation and to bring in "improper" or otherwise "undesirable" advertisements. Mr. Gammans, Assistant Postmaster General, said that he doubted whether the words suggested by Mr. Houghton were really necessary. They had accepted the amendment in the Lords because the Merchandise Marks Act would not apply to television advertising. The exclusion of misleading advertisements would be one of the principal tasks of the body to be established to advise on standards of advertising; in short, the safeguards already accepted were adequate and did not need the suggested enlargement. The House concurred in this view by a majority of twenty.

In reply to a question asked in the Commons recently Mr. Lennox-Boyd, then Minister of Transport and Civil Aviation, stated that the automatic train control apparatus now on trial with British Railways had brought about a marked improvement. The British Transport Commission was proposing to extend the trial stretch for an additional distance in an attempt to attain the high standard of reliability necessary in safety equipment. Widespread extension of automatic control was desirable for safe railway working, but the introduction of a system doubtful in its effect would increase and not decrease risks. They were therefore proceeding by trial and error and avoiding overhasty improvisation which might lead to disaster.

Higher Technological Education

A quietly efficient body is the Parliamentary and Scientific Committee, made up of members of both Houses of Parliament interested in scientific and industrial questions, together with representatives from outside bodies and learned societies. Last week it issued a memorandum on higher technological education. The Committee proposes the establishment of Royal Chartered Colleges of Technology with the right to award degrees, and thinks that up to twenty existing colleges of technology might be considered eligible. These colleges, the Committee considers should prove a valuable supplement to the universities in providing the highly qualified technologists which the country urgently needs. Advanced full-time sandwich courses, part-time day and evening courses, post-graduate courses and facilities for research would be offered. Entry could be straight from advanced general school, provided a high standard had been obtained, or through possession of an Ordinary National Certificate. Financial independence for the proposed colleges is advocated on a quinquennial basis and grants might be controlled by a special committee analogous to the Universities' Grants Committee.

The Committee underlines a point often made by those with knowledge of the problems of technological education, i.e., that the ultimate ability of the universities and colleges to turn out an adequate number of graduates of high calibre depends in the beginning on an early real demand from the school population for science and technology. It is hoped that the Government will take action to improve facilities for teaching science in the nation's schools.

LETTERS TO THE EDITOR

Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for the opinions expressed by correspondents.

Earthing Methods

I HAVE been very interested in Mr. J. A. Winchester's very thoughtful comments on my article, but I feel it would be truer to say that more objections to, or criticisms of, voltage-operated leakage trips are based upon purely theoretical considerations than any aspects of my advocacy of them. I have now used leakage trips in my own domestic installations for over twenty years, and can thus claim to be familiar with their little ways. If only more engineers would do this we should all have a far greater appreciation of the capabilities of these devices.

To deal with Mr. Winchester's points; in my previous flat I used a leakage trip to control an immersion heater in a storage tank, and found that by "shorting-over" the phase to the earth terminal at the heater I could invariably bring out the breaker without blowing the fuse; the auxiliary electrode for the trip was a driven rod in damp earth about 10ft away from the tank. There would be some substance in Mr. Winchester's doubt if the storage tank were directly connected to earth by means of a main water supply pipe, but it is not; in practically all cases the tank is fed from a small auxiliary tank in the roof which may or may not be earth-connected. In any case, there are red-leaded pipe joints in the feed and to the tank; usually these runs exhibit quite a high impedance, and it is not difficult to get leakage trips to work quite effectively.

I have found that prospective users of leakage trips in this or similar types of installation have been afraid to make the direct earth fault test at the tank, but have instead tried to get the trips to work through a test lamp or resistance—over which the major voltage drop takes place. If they will screw up their courage and try a direct fault it will often be found that trip electrodes can quite often be placed close to the main earth connection—should one exist, and not be of the illusory type usually found with immersion heater installations.

Regarding Mr. Winchester's point that a check by the test key does not indicate continuity of the earth connection between the appliance and the trip, this is true, but here again the simple flash test can always be made at the appliance terminals, a method I adopt with my own equipment. A screwdriver placed between the switched-on element of a radiator and the casing is a good check, and the ladies of my household check the kettle connections at the cooker by switching on and placing first one and then the other of the contact sockets over a hook used for a cooker cloth; one or other will bring out the trip in the cooker control panel.

I do not agree with Mr. Winchester's contention that voltage-operated trips cannot afford protection against fire. Heavy fault currents cannot flow even over very good earth continuity conductors and electrodes without setting up a voltage, and it has to be pointed out that a leakage trip can operate with only 8–10 V across the trip coil. It is only when its electrode is of high impedance that it needs the values mentioned in B.S. 842. Even 10 A with a 1 ohm electrode can produce sufficient voltage, but invariably the actual voltage will be much higher than this.

However, we could go on discussing theoretical points for a very long time, but I should like Mr. Winchester to make an experiment for himself. He should arrange a piece of metal directly earthed to a water pipe and a circuit through a leakage trip in parallel, with a reasonably good auxiliary electrode. With the application of a direct earth fault to the metal I am prepared to bet that the trip would come out before the fuse blew. Modern trips operate within 10 milliseconds with 240 V applied, and this to my mind represents safety.

If Mr. Winchester wishes it I shall be pleased to give him the name of one firm now placing differential-current trips on the market, but would also remind him that a leakage from the neutral in the installation will effectively put these devices out of action.

Folkestone. T. C. GILBERT, M.I.E.E.

Domestic Heating

THE recent correspondence in the *Electrical Review* on the above subject, including the letters from Mr. A. F. Mare and Mr. G. A. Buckle in the 23rd July issue, and the leaderette "Off Peak Heating" also in that issue, indicate the interest in this subject.

In my article I tried to make the point that there was a place for all fuels, and in many cases the ideal for a domestic installation was a combination of two and possibly more fuels.

With regard to Mr. Buckle's letter, I notice that I failed to emphasize that in addition to using "Coalite" in the domestic boiler, I also use it on a free standing "Hurdapta" convector fire with restricted throat and I have been able to get down to a fuel consumption as low as 60 lb per week, but of course everything depends upon the outside temperature, which brings me to Mr. Mare's letter in which he puts the case for block heaters.

Block heaters are all very well in a climate in which you can guarantee that the winter will be consistently cold or alternatively consistently mild. Unfortunately in this country we have a climate which provides us with winter in summer and sometimes summer in winter. The result is that the heating engineer for an electrical heating installation using block heaters, has to provide for Arctic conditions which arise occasionally, and so, because these block storage systems cannot be properly thermostatically controlled, most of the winter the premises are overheated and a great deal of the heat is allowed to go to waste as a result of opening windows, etc., to get comfortable conditions.

I have been experimenting with block storage heaters which, as your editorial rightly points out, are by no means new—in fact they are one of the oldest forms of electric heating. Thermal storage heaters died a natural death and most of us in the heating engineering trade hoped that they would remain dead because no one can possibly claim that they are an efficient method of heating, though it is true they can provide an off-peak load which is their only virtue as far as one can see. There is another virtue *at the moment* due to the fact that for some reason which is very difficult to understand, they are free from purchase tax, whereas more efficient electric radiators suffer from a penalizing tax of 50 per cent. Why there should be this favouritism on the part of our Civil Service is beyond me. Finally block heaters enjoy an exceptionally favourable

tariff. Whether this tariff will be justified indefinitely is questionable.

From the experiments which I have conducted it would appear that in a mild winter one can show that approximately twice as much electricity (or more) is used by a block storage heater as would be used by a properly designed heating installation of low surface temperature such as oil filled electric radiators under thermostatic and time switch control. One can argue, of course, that the electricity used by the block storage heater is off-peak, but the essential point I want to make is that nevertheless twice as many kWh as are really necessary are used.

The thermal carry over of fluid filled radiators in a reasonably insulated building is about an hour, and if the supply industry is anxious to fill in its valleys without increasing its peaks, this can easily be done by means of load control so that the water heating and space heating, or for that matter the power circuit load of groups of domestic dwellings could be rippled off for a period of half an hour or an hour, and thus achieve the same desirable object.

Alternatively one could, of course, have a time-of-day tariff and if the public kept their water heaters and space heaters on during the peak period, then they could be made to pay accordingly. Surely electricity is too refined a fuel to waste, especially when it is used for heating, and therefore one requires a method of heating which will use the minimum amount of electricity but achieve reasonable comfort standards, not a method which has to use the maximum amount of electricity to cater for very cold conditions. If the argument is that you can design your block storage heating system in such a way that you only cater for moderate conditions, then what is the customer supposed to do during extreme cold? Does he then have to switch on electric fires at the very time when the supply authority does not want him to?

London, W.1. A. C. HAZEL.

This correspondence must now be closed.—Editors, *Electrical Review*.

Branch Businesses in Canada

BRITISH manufacturers or suppliers of goods who contemplate establishing branch businesses in Canada may derive assistance from a 14-page pamphlet produced by the Board of Trade entitled "Setting Up a Subsidiary in Canada." The Board stresses that this is a general guide only and that anyone contemplating the establishment of a branch concern in Canada must consult specialists in the subject; the pamphlet does indicate, however, some of the agencies which can give more detailed guidance.

It is shown that whatever method of financing such a venture is adopted the Bank of England must be informed for the Bank has to decide whether or not the proposal is in the national interest. Treasury permission has also to be obtained for certain transactions.

The three principal forms which the Canadian organization may take are considered: they are sole proprietorship or partnership; branches of foreign companies; and limited companies. An outline is given of the requirements of the Dominion and Provincial Governments in relation to limited companies and the methods of registration and other relevant matters.

Another section deals with the incidence of Federal and Provincial taxation on corporations and the names and addresses are given of "useful contacts" in the Provinces of Canada. Copies of the pamphlet are obtainable (free of charge) from the Board of Trade, Commercial Relations and Export Department, Room 4170, Horse Guards Avenue, London, S.W.1 (telephone: Trafalgar 8855, extension 2625).

Fair Trading Policy

Amendment of Definitions

ONE of the objects of the Electrical Fair Trading Policy is to define the functions of the various sections of the electrical industry, and to ensure that the needs of the industry are adequately reflected the Policy is kept constantly under review. As an outcome of recent deliberations the Electrical Fair Trading Council has agreed that it is desirable to amend the two definitions relating to the electrical contractor and the electrical retailer.

This definition of electrical contractor has been amplified as follows, as correctly representing current conditions for incorporation in the Policy in due course:—

> "The term 'Electrical Contractor' means any person or persons, company or firm or department thereof, with suitable premises and the necessary equipment, principally engaged in the business of installing and selling electrical products, employing either as principal or operative, a person or persons having served a recognized electrical apprenticeship or in possession of other equivalent qualifications."

In a technical industry it is undoubtedly desirable that its channels of distribution should be through outlets possessing skilled staff and able to accept responsibility for "after sales" service. The definition of electrical retailer has therefore been strengthened accordingly, to read as follows, and is being incorporated in the Policy forthwith:—

> "The term 'Electrical Retailer' means any person or persons, company or firm with shop or showroom premises and equipment suitable for a retail trade or equivalent facilities for resale, who carries a reasonable stock of electrical products and accepts responsibility for after sales service for such products."

Printed amendment slips for insertion into the Policy, in respect of the "Electrical Retailer" definition, will shortly be available and application should be made to the secretary of the Council, Sardinia House, Kingsway, London, W.C.2, for free copies.

Holidays-With-Pay Dispute

UNDER a holidays-with-pay scheme agreed by the National Federated Electrical Association and the Electrical Trades Union payment for the holidays of employees in the electrical contracting industry may be made or provided for either by means of weekly credits (involving a stamped card system) or by payment in cash at the time the holiday is taken. In the case of the termination of employment the stamped card is handed to the employee who passes it on to his next employer.

A non-federated firm of electrical contractors in the Manchester area, Burke & Co., Ltd., elected to pay in cash the amount accrued in respect of holiday payment to any operative whose employment was terminated during the year. The Electrical Trades Union contended that this was unsatisfactory; it militated against the successful operation of the scheme because through financial stress an employee might have to spend the cash received on leaving the firm.

When the matter was taken to the Industrial Disputes Tribunal the company stated that it had contracted out of the scheme when the holiday was increased from one to two weeks and the weekly credit had risen from 2s 6d to 6s 6d. Employees were given two weeks' pay at the current rates when they took their holidays. The Union's contention that the company was compelled to stamp holiday credit cards was disputed.

After due consideration of the evidence of both parties the Tribunal found in favour of the Union's claim and decided accordingly. (Award No. 573, H.M. Stationery Office, 4d.)

Pakistan Import Control

The *Board of Trade Journal* of 31st July contains a list of goods for which the Government of Pakistan has decided to issue import licences during the latter half of this year. It includes a wide range of electrical machinery, plant and equipment.

INDUSTRIAL NEWS

Scottish Electricians' Wages

As the result of a recent hearing the Industrial Disputes Tribunal has ruled that an increase of ½d an hour in the wages of electricians employed by members of the Electrical Contractors' Association of Scotland shall date from 15th March last (as in England and Wales) and not 19th April as contended by the employers. A representative of the E.C.A. of Scotland said that his Association rejected the implications of the claim repeatedly made by the Electrical Trades Union that the Association should always follow to the letter any settlements made in the electrical contracting industry in England. The Tribunal's award (No. 567) is obtainable from H.M. Stationery Office, price 2d.

Wholesalers' New Premises

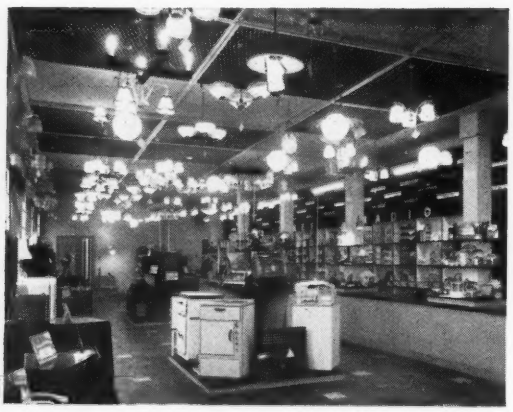
On 27th July new premises were opened in Baillie Street, Rochdale, for Hardman & Co., Ltd., wholesalers of electrical goods, etc., by Alderman C. H. Bryning, O.B.E., J.P. The building " Hardale House " is a five-storey self-contained block with about 45,000 sq ft of floor area and a frontage of 120ft. Behind the main block is a 160ft long single-storey building for vehicle housing and maintenance.

On the ground floor are the receiving and dispatch departments. The first floor comprises the trade counter, showroom and stockroom, and the offices occupy the second floor, with auxiliary storage space. Above the third floor, used for storage, are the servicing and maintenance departments.

The building is well served by lifts and there are adequate external and internal communication services.

At a luncheon which followed the opening the speakers included Mr. F. Grindrod (managing director), Mrs. L. Grindrod (director), Alderman Bryning, and Messrs. W. Harries (Regentone Radio & Television, Ltd.), A. R. Mitchell (Philco (Great Britain), Ltd.), L. S. Hargreaves (Aerialite, Ltd.) and A. J. Emery (General Electric Co., Ltd.).

On Friday last the Company gave a party for its staff and their relatives and friends. About 150 were present at a dinner, presided over by Mr. Frank Grindrod, and a subsequent dance.



Messrs. Hardman's new Rochdale premises

Richardsons, Westgarth to make Gas Turbines

For many years Richardsons, Westgarth & Co., Ltd., have manufactured steam turbines, blowers and other equipment under arrangement with Brown, Boveri, Switzerland. It is now announced that they have extended their manufacturing agreement with Brown, Boveri to cover the manufacture of gas turbines for all purposes.

Under the agreement Brown, Boveri will make available to the company their designs, patents and research experience.

A.E.A. Takes Over

On Sunday last, 1st August, the new Atomic Energy Authority assumed responsibility for atomic research and development and took over the atomic energy research and development undertakings in this country. The chairman of the Authority is Sir Edwin Plowden.

Lyons Electricians' Strike

It was reported earlier this week that about 100 of the 400 electricians employed by J. Lyons & Co. who have been on strike since April had returned to work.

Trade with America

H.M. Stationery Office has published for the Board of Trade a revised edition of " Exporting to the United States of America " (3s 6d), a *vade mecum* for manufacturers and others interested in this trade. In its 60-odd pages this guide covers a wide and varied range of subjects. The first chapter is a general review of the characteristics of the United States market (including the " psychology " of the Americans) with notes on features peculiar to the various regions. Preliminary steps to entering the market are discussed — market research, visits, etc.—and there is a section on selling and distribution in the course of which advice is given on representation, selection of salesmen etc.

Many methods of sales promotion and methods of conducting business are briefly outlined and Government regulations affecting exporters to the United States are reviewed. The final section deals with the services offered by the Export Credits Guarantee Department in relation to British trade with North America.

There are a number of appendices containing a variety of practical information on many aspects of the United States and on other subjects affecting British exporters to that country.

N.Z. Duty on Motors

The New Zealand Government has imposed a duty of 15 per cent *ad valorem* on electric motors of not less than 1 b.h.p. but less than 6 b.h.p. under the British preferential tariff and increased the duties under the most-favoured-nation and general tariffs. Free entry under the British preferential tariff is maintained for other types.

Supergrid Transformers

In the illustrated note in our issue of 16th July relating to the Metropolitan-Vickers 120 MVA 132/275 kV transformers for the British Electricity Authority, there was a small but important error in the passage dealing with the sequence of the tests. This passage should read as follows. The sequence of the tests, which were applied to the 275 kV and 132 kV terminals in turn, was: (1) calibration shot, (2) one 100 per cent full-wave shot, (3) and (4) two 115 per cent chopped-wave shots, and (5) and (6) two 100 per cent full-wave shots.

Prices of Materials

In the accompanying table we give the basis prices of the more important materials used in the electrical industry. The figures given are the selling prices and are those quoted on Tuesday last.

ALUMINIUM Ingots	ton £156 0s 0d
COPPER, H.C. Electro	ton £234 10s 0d
Fire Refined 99·70%	ton £233 0s 0d
Fire Refined 99·50%	ton £232 0s 0d
COPPER Tubes ..	lb 2s 3⅜d
Sheet	ton £295 15s 0d
H.C. wire and strip ..	ton £264 5s 0d
LEAD, English ..	ton £92 5s 0d
Foreign	ton £91 0s 0d
MERCURY	flask £100 0s 0d
TIN, block (English) ..	ton £746 0s 0d
ZINC, G.O.B. Foreign	ton £74 15s 0d
Electrolytic	ton £83 0s 0d
BRASS Tubes (solid drawn)	lb 1s 10½d
Sheet	ton £242 5s 0d
Wire	lb 2s 6d
PHOSPHOR BRONZE Wire	lb 3s 9½d
PLATINUM	oz £30 0s 0d
RUBBER, No. 1 R.S.S. spot	lb 20½d–20⅝d

Royal Welsh Show

The adverse weather conditions which have threatened so many outdoor activities this summer almost swamped the recent Royal Welsh Show at Machynlleth, and the electricity stand organized by the Merseyside and North Wales Electricity Board was so flooded on the Saturday preceding the opening that the fire brigade had to be called to pump the water from the site. When the Show opened the stand was in readiness to receive visitors, and the accompanying picture indicates some of the equipment on show.

The joint display by M.A.N.W.E.B. and E.D.A. at the Royal Welsh Show

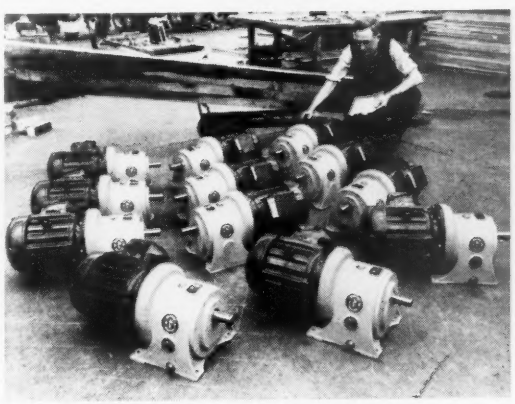
European Management Conference

The first European conference devoted entirely to management problems is being held at Torquay from 20th to 23rd October next. It is being organized by the British Institute of Management at the request of the European Council of the International Committee for Scientific Management (C.I.O.S.). It will be attended by representatives from fourteen European countries. The theme of the conference will be " The Contribution of Management to European Prosperity." Five sessions of the conference will be devoted to education and training for management, including a session on the foreman or supervisor. The speakers will include His Excellency Dr. D. U. Stikker, G.B.E., Netherlands Ambassador to the United Kingdom, Mr. Harold Macmillan, M.P., Minister of Housing and Local Government, Monsieur R. Marjolin, the French economist and secretary general of O.E.E.C., and Senor Jose Ortega y Gasset, the author of " Mission of the University."

Geared Motors for South Africa

The accompanying picture shows part of a consignment of geared motors, made by the Coventry Gear Co., being prepared for dispatch to South Africa. Twenty have been ordered by the Epic Oil Mills, Ltd., of Johannesburg; they are double reduction units designed for an input speed of 1,430 r.p.m. and an output speed of 105 r.p.m. They will be installed in a new factory which is being built at Johannesburg for the production of edible, medicinal and industrial oils, cooking fats, margarine, peanut butter and soaps. The self-contained " Coventry " geared units, which are fitted with Crompton Parkinson totally enclosed 3 h.p. fan-cooled motors, can be mounted in any of six operating positions. They will be used to drive conveyors.

Geared motors made by the Coventry Gear Co. for dispatch to South Africa



" Mechanicals " Headquarters

Because of the recent re-naming of streets by the L.C.C., the Institution of Mechanical Engineers' address is now 1, Birdcage Walk, Westminster, London, S.W.1.

Drill Fatality

The suggestion that the present " accepted practice " of making the green leads from electrical appliances the earth wire should be made a statutory obligation, was made on 23rd July by the coroner for Cannock (Staffs), Mr. K. T. Braine-Hartnell, at an inquest when a verdict of " Accidental death " was recorded on Donald Walter Thorne, who received a fatal electric shock while using a hand drill at a building site in Cannock. It was stated that the man's employer, Mr. J. Evans of Heath Hayes, had connected an additional piece of flex to that already in the drill and in so doing he had wrongly assumed that the green wire would be the earth connection.

An electrical engineer, Mr. A. A. Bradbury, told the court that it was reasonable to assume that the green wire was the earth. The drill, however, had been bought in 1943, and Mr. Bradbury said that although it was now the normal practice to use the green wire as the earth, it might not have been so in 1943. The type of two-pin plug being used would normally have prevented such an accident happening.

Insulated Wire Works Extension

F. D. Sims, Ltd., of Hazelhurst Works, Ramsbottom and Bury, are to extend their Ramsbottom works; this will be the third extension since the company commenced business in Ramsbottom as manufacturers of insulated copper wires and strip in 1936. The wire-drawing and fitting departments, in particular, will be completely reorganized, and the additional space will also allow for an improved works canteen.

Mr. K. O. Engel, managing director, informs us that the extension is a further step towards making the business independent and self-contained. Developments in recent years have included the drawing of copper wire, and the manufacture of varnishes and enamels in a modern laboratory and varnish kitchen. In addition, a large proportion of the company's requirements of wooden reels is supplied from a branch works at Bury. It is hoped that the acquisition of depot premises in London in the near future will accelerate deliveries to buyers in the London area.

Wild-Barfield Works Visit

As in previous years Wild-Barfield Electric Furnaces, Ltd., Elecfurn Works, Watford By-Pass, Watford, invites parties of up to thirty senior engineering students from technical colleges and members of technical societies to visit its works during the winter months (September to May). The tour includes visits to the production shops, metallurgical and chemical laboratories and the development section.

Brush Overseas Sales

Special additional service facilities to assist overseas sales were discussed at a recent conference held by the Brush Group, Ltd., at Loughborough. To augment the service given by individual factories, the group has introduced a new scheme whereby service engineers are now travelling over-

seas markets on behalf of the group. A number of service engineers present at the conference had each completed one major tour. The extension of the scheme by the appointment of more group service engineers is now being considered.

"Serving Science and Industry"

The Industrial Products Division of Philips Electrical, Ltd., announces the introduction of a new monthly publication "Philips Serving Science and Industry." Similar in approach to the well-known "Philips Technical Review," it will be devoted to new types of industrial equipment and processes covering a wide field. Emphasis will be laid on applied industrial electronics and articles dealing with new developments in arc, resistance welding and filtration will also be included from time to time.

Although primarily directed to technical readers, many articles will be concerned with practical production problems of a widely differing nature which should prove of interest to industrial management. Requests for copies, free of charge, should be made on official notepaper to the Publication Department, Philips Electrical, Ltd., Century House, Shaftesbury Avenue, London, W.C.2.

Fire at L.D.C. Works

A fire which broke out early on Wednesday last week destroyed the laboratories and pattern shop of the Lancashire Dynamo & Crypto Co., Ltd., at Trafford Park, Manchester. Much valuable equipment was lost but no original drawings, and arrangements have already been made for the pattern work to be carried on elsewhere. The works were closed for the summer holidays at the time. There will be no interference with production.

Clock Showrooms

Members of the jewellery and electrical trades recently visited the modernized West-end showrooms of Smith's English Clocks, Ltd., at 179–185, Great Portland Street, London, W.1. In this new attractive setting there is on view every type of clock and watch manufactured by Smith's, including the "Sectric" range. The exhibition is a permanent one and is open to all sections of the trade.

Coffee Making Equipment

A permanent comprehensive display of the "Cona" range of coffee makers for the catering trade has now been arranged in the showrooms of Wm. Page & Co., Ltd., 87, Shaftesbury Avenue, London, W.1. The range of models covers glass coffee makers supplying from 12 to 800 cups per hour, and a demonstration unit can be used to provide samples of freshly made coffee for customers visiting the showrooms.

Large Steam Turbines

A publication under the above title by the General Electric Co., Ltd., is much more than the usual trade technical publication. Written under the following headings it is a practical treatise on the subject: Design, research, construction, governing, feed heating, installations and arrangements. It is well written, easy to read and profusely illustrated. But perhaps the highlights of the publication are the highly informative double page coloured layout of the feed heating arrangements of a 60 MW turbine and the detailed sectional drawings of turbines of various types and sizes.

Rye House Station

It should have been mentioned in our description of the Rye House power station of the Eastern Division, B.E.A., that the four main 45 MVA 33/132 kV transformers were supplied by the Fuller Electrical Co., Ltd. Other transformers in the station were also supplied by this company.

Damages Award

At Glamorgan Assizes at Swansea recently damages of £350, including special damages, were awarded by Mr. Justice Byrne to Howell Glyn Thomas of Morriston, who claimed against the South Wales Electricity Board in respect of personal injuries received in June, 1951, when an oil circuit breaker exploded at the Board's substation at the premises of Weaver & Co., Ltd., Swansea. Thomas, aged 64 at the time of the accident, was employed by Weaver & Co. as a maintenance electrician. A doctor had said that although Thomas had recovered from the physical burns the explosion had caused a scar on his mind, which produced a state of fear each time he approached an apparatus such as that involved in the accident.

A view of the modernized West-end showrooms of Smith's English Clocks, Ltd.

Trade Announcements

Metway Electrical Industries, Ltd., has moved to a new factory. The main entrance and offices are at Metway Works, Canning Street, Kemp Town, Brighton, 7, and the goods entrance in Hendon Street, Kemp Town, Brighton, 7. The telephone number is unchanged.

G.W.B. Furnaces, Ltd., has appointed Mr. T. G. Smith as outside representative in the control gear division, covering the counties of Yorkshire, Nottinghamshire, Derbyshire, and Lincolnshire.

Catalogues and Lists

Everett, Edgcumbe & Co., Ltd., Colindale Works, Hendon, N.W.9.—Catalogue sheet giving the latest details of the company's portable insulating oil tester (500).

Knightshades, Ltd., Derby Road Works, Edmonton, N.18.—Illustrated priced catalogue of table lamps, lampshades and decorative lighting fittings including "Nylux" shades (58).

Hackbridge & Hewittic Electric Co., Ltd., Walton-on-Thames, Surrey.—Leaflet dealing with Hewittic rectifiers for mining service (R.248).

Saxon Components, Ltd., 177, Kingsland Road, London, E.2.—Catalogue of Saxon "Gold Star" fluorescent lighting fittings, together with price list.

International Refrigerator Co., Ltd., Peterborough.—Two specification sheets dealing with the "Coldrator" service cabinets, DS.130 and DS.180.

Electroway Heaters, Ltd., Loughborough, Leics.—General catalogue covering the company's range of electrical heating equipment (400) together with price list (654).

TRADE MARKS

APPLICATIONS have been made for the registration of the following trade marks. Objections may be entered up to 14th August:

ELECTROVAC. No. 726,081, Class 9. Electric suction cleaners, parts and fittings.—Bylock Electric, Ltd., 109, South Street, Enfield.

WELCARB. No. 726,207, Class 9. Electric resistances made of carbon. WELMET. No. 726,210. WELVIT. No. 726,211, Class 9. Electric resistances.—Welwyn Electrical Laboratories, Ltd., Trading Estate, Bedlington Station, Northumberland.

SILIC-O-NETIC. No. 726,425, Class 9. Electrical and electronic apparatus and instruments.—Heinemann Electric Co., Trenton, New Jersey, U.S.A. Address for service, c/o Sefton-Jones, O'dell & Stephens, 15, Great James Street, London, W.C.1.

GRAETZIN (design). No. 728,334, Class 9. Radio and television apparatus, and parts.—Graetz Atk.-Ges., Hamburg, Germany. Address for service, c/o Marks & Clerk, 57 and 58, Lincoln's Inn Fields, London, W.C.2.

PORTADYNE. No. 729,849, Class 9. Radiogramophones, gramophones, etc., television apparatus and instruments and parts.—Dynaport Radio & Television Ltd., Portadyne Works, 30–34, Gorst Road, North Acton, London, N.W.10.

TOROSTAT. No. 730,084, Class 9. Electrical resistors and parts.—Cressall Manufacturing Co., Ltd., 31–32, Tower Street, Birmingham.

DURATRAK. No. 730,234, Class 9. Electric transformers.—General Radio Co., Cambridge, Massachusetts, U.S.A. Address for service, c/o McKenna & Co., 12, Whitehall, S.W.1.

Hydro and Thermal Generation

British Practice Described at World Power Conference

PAST development, present position and future plans for co-ordination of water power and steam power stations in Great Britain provided the subject of a paper presented by J. D. Peattie and A. A. Fulton before the Brazilian sectional meeting of the World Power Conference (see *Electrical Review*, 16th and 30th July). At 31st December, 1953, the authors stated, 520 MW of hydro-electric plant was in operation with an annual output of 1,276 million kWh; of this 316 MW (675 million kWh) had been commissioned since the end of 1945. A further 417 MW (1,277 million kWh) was under construction and 278 MW (986 million kWh) was under promotion and survey.

Hydro stations remote from load centres are of only sufficient capacities to use water normally available for long hours at about full load; those near load centres are designed to use all water available at peak loads. Thermal stations supplied with cheap fuel carry base loads and those near load centres where fuel is expensive are operated only at peak times; stocking capacity is provided at new stations for 25 per cent of annual consumption.

In Scotland run-off in winter averages about two-thirds and in summer one-third of the annual average. Rainfall in an exceptionally dry year is about two-thirds of the long-term average and in a very wet one half as much again.

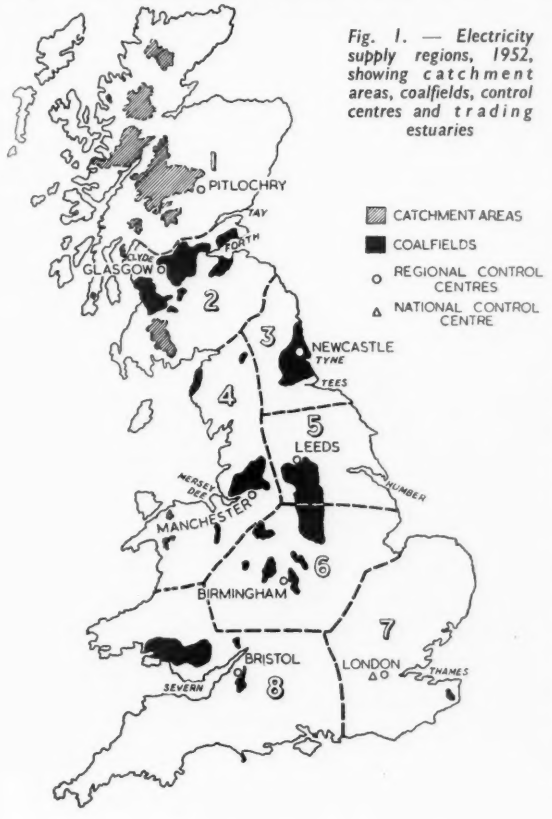


Fig. 1. — Electricity supply regions, 1952, showing catchment areas, coalfields, control centres and trading estuaries

Peak or day load stations nearer the load centres operate with limited storage and in periods of extraordinary flows run continuously at full load, permitting the closing down of the less economical steam plant. The ratio of storage capacity to annual kWh output varies typically from 54 per cent for the Garry-Moriston scheme(200 million kWh storage) to 16 per cent for Galloway (36 million kWh storage).

Mountain ranges have general elevations of 2,000 to 3,000ft above sea level, rainfall varying from 150in in the western to 50in in the eastern Highlands, and a temperate climate with no prolonged frosts and with low evaporation losses. Networks of collecting aqueducts are provided, their cost being balanced against the value of extra output.

Almost all Scottish hydro-electric schemes have to provide for the preservation of migrating fish, principally salmon, and the amount of water set aside for the purpose may be from 5 to 15 per cent or more. To maintain minimum flows in rivers some plants have to run continuously.

Co-operation between the control centres of the North of Scotland Hydro Electric Board (Pitlochry) and the British Electricity Authority (London) is governed by an agreement which provides for the acceptance by the B.E.A. of firm supplies (declared annually in advance) of a minimum number of kW and kWh and of additional supplies expected to be available in the following week (declared at least three days in advance) or due to sudden excessive rainfall. As a result of unexpected rain 50 million kWh was exported to the B.E.A. in excess of the annual agreed firm delivery in 1952.

The North of Scotland control engineer, after meeting consumers' demands in his own area and the firm bulk supply declared to the B.E.A., can either increase supplies to the B.E.A. or restrict generation at his two thermal stations at Dundee and Aberdeen (168 MW) as may secure greatest economy locally.

In 1952 the total output of public supply stations in Great Britain was 58,693 million kWh. Integration of hydro and thermal generation is largely confined to Scotland, where in 1952 hydro stations sent out 1,150 million kWh or 22 per cent of the total Scottish output of 5,174 million kWh. The North of Scotland Board had available at hydro sources 887 million kWh, or 16 per cent of the Scottish total, and imported coal from the S.E. Scotland Area to generate a further 289 million kW, making the total figure 1,131 million kWh, of which 867 million was supplied to its own consumers and 304 million was exported to the B.E.A. for the S.W. Scotland area.

There was thus a triangular situation with heavy consumption in the south-west, ample coal supplies in the south-east and three-quarters of the hydro supplies in the north. This situation indicates the essential part of the high-voltage grid in enabling hydro-plant to be planned to contribute to the general pool of thermal plant instead of dealing in isolation with a restricted load.

At the time of the national peak half hour on 31st December, 1950, North Scotland exported 182 MW, of which 137 MW was taken by South Scotland, the balance

A= Shin, 6 power stations, 40 MW 150 million kWh; B= Conon, 6 power stations, 107 MW 440 million kWh; C = Affric, 1 power station, 68 MW 230 million kWh; D = Garry-Moriston, 6 power stations, 95 MW 370 million kWh; E = Tummel-Garry, 6 power stations, 236 MW 600 million kWh; F = Breadalbane, 8 power stations, 118 MW 385 million kWh; G = Sloy, 4 power stations, 181 MW 220 million kWh; H = Clyde, 2 power stations, 16 MW 80 million kWh; J = Galloway, 5 power stations, 103 MW 224 million kWh

Fig. 2.—Catchments now being developed for Scottish hydro-electric schemes

being received by England to compensate for deficiencies there, notably in the south-west.

Between 1947 and 1952 the kWh sold in Scotland increased by 52 per cent, compared with 47 per cent for the whole of Great Britain, and is expected to increase steadily for many years over the whole country. Plans for development of thermal stations are based on the National Coal Board's plans for allocating the coal required for electricity supply from individual coal fields. In Scotland the proportion of coal obtained from and the number of thermal stations in the south-east will increase.

A corresponding development of hydro resources in the north is expected to produce these 3,500 million kWh soon after 1960 as well as 5,500 million kWh in thermal stations. The potential hydro output is estimated at 10,000 million kWh per annum. Geographical conditions and load characteristics do not appear to justify pumped storage on economic grounds, but possible schemes are being studied.

Power from the Severn estuary, where the tidal range varies from 47·6ft to 22·2ft, with MW outputs between 800 and 300 in spring and neap tides, would give an annual output of 2,300 million kWh, saving a million tons of coal. It would become economic if coal prices continued to rise and the construction of the 275 kV grid would help to absorb the output. The load in S.W. England on a summer evening is already over 3,000 MW and even during nights the tidal energy could be accepted by the grid.

Vegetable Wastes as Fuel

MANY wastes consist of carbonaceous matter, the carbon and hydrogen of which combine with oxygen to evolve heat, and are therefore potential fuels. In a World Power Conference paper, Dr. A. Parker and Mr. T. F. Hurley (Department of Scientific and Industrial Research) considered the combustion of vegetable wastes in relation to power production.

Whether their use was feasible, the authors pointed out, depended upon the overall cost entailed in comparison with that incurred with normal fuels, which would depend partly on local circumstances. Factors other than combustion included the quantity available at any time in relation to power requirements, regularity of supply, and costs of labour and capital for storage. High moisture content, which increased transport costs, delayed ignition and impeded combustion, and the effects of the ash on refractory and metal surfaces were among the difficulties encountered.

Methods adopted for evaluating combustion properties of different classes of coal showed that smaller variations existed between wastes than between mature and less mature coals, and that these variations could be predicted by extrapolation.

Moisture content varied from 10 per cent for sawdust from seasoned timber to 80 per cent for wet bark, 50 per cent being common; peat might contain over 90 per cent at the bog. Dry calorific value of many wastes was about 8,000 B.Th.U./lb, so 1 lb of dry material could not evaporate more than 7 lb of moisture. Hence all the heat in a fuel 85 per cent moist would be absorbed in its own drying and its use would depend upon the availability of waste heat or prolonged air drying.

Volatile matter in most vegetable wastes was between 60 and 80 per cent and fixed carbon was from 3 to 6 per cent, compared with under 1 per cent with coal. Ash content, from foreign matter, was basically low, but its high alkali content was readily carried through the combustion and heating system by gaseous products of combustion, tending to fusion of ash and refractory surface linings and to formation of deposits on metal heating surfaces. Carbon dioxide formed 40 to 60 per cent of gases, which materially lowered its heating value.

The paper gave particulars of typical appliances that have been developed for the combustion of vegetable wastes. Those most successful take full advantage of the properties of the fuel which laboratory determinations show to be most favourable to good combustion and provide adequate precautions to cope with physical characteristics.

Examination of the Brain

A CHANCE conversation between a member of the staff of the Stafford General Infirmary and a member of the English Electric Co., Ltd., has led to the production of what is believed to be the first equipment of its kind in the world for use in X-ray examinations of the brain.

Known as angiography of the brain, this examination is one of the most delicate of X-ray operations. It involves injecting the patient with a solution which is opaque to X-rays, thus rendering visible the brain's network of arteries in X-ray photographs. The solution which is injected is dissipated throughout the brain within a matter of from 5–10 sec, and speedy and accurately time controlled X-ray exposures are then required. Hitherto the timing of the exposure has had to be done either manually or by the use of cinematography, neither of which had proved satisfactory.

The English Electric Co., Ltd., decided to attempt to produce a new type of timer device to solve the problem. The resulting prototype equipment, which is being used in the Stafford General Infirmary, comprises a casette changer, electronic sequence and exposure timer, and a mobile carrier. It enables a radiographer to use a sequence of X-ray exposures to pre-determined exposure times and with controlled time delays between exposures.

Engineering in Europe

Abstracts from Foreign Technical Journals

THE type of foundation described has been successfully used for a number of years, partly below highly stressed 110 kV trellis-type masts, and has mechanical and economic advantages over the conventional block-type concrete foundation in soft grounds. The foundation is formed by a combination of driven "standards" the upper ends of which are united by cross members or a frame, all of ferro-concrete and, where necessary, stabilized by gravel "linings" poured into the excavations.

The standards are of spun concrete and have separate hollow-conical footings; the frame parts are vibration-compacted. In difficult cases the erection of the combined foundations may become more expensive than that of block foundations, but in these cases they may represent the only satisfactory type of foundation available. The article describes and depicts the various stages of the erection work and shows stress distribution in the soil.—"Special Foundation for Overhead Line Masts in Insufficiently Firm Ground," H. Mors, *E.T.Z.* (*A*), Vol. 75, No. 8, pp. 283–284, 11th April, 1954, in German.

Mechanical Rectifiers

The "rolling rectifiers" described are characterized by uniform speed of rotation, high separation speeds of the contacts and large distances between electrodes during the blocking period. The rotary movement also reduces the mechanical and electrical contact wear. The rapid displacement of the actual point of contact on the contact roller enables heavy currents to be passed through rollers of a comparatively small cross-section. Also, the point of contact-making is far from that of contact-breaking and between them is the segment carrying the largest fraction of the rectified current and unaffected by the heavy circuit-making and breaking stresses. That is why the occurrence of making and breaking arcs is in this type of rectifier comparatively harmless. There are arrangements with contact rollers side by side, and others in which rolling contacts revolve inside stationary segmented rings. Rolling rectifiers for heavy voltages are operated with commutating reactors, h.v. rectifiers with quenching nozzles.—"Mechanical Rectifiers with Contacts Rolling on Each Other: Rolling Rectifiers," E. Marx, *E.T.Z.* (*A*), Vol. 75, pp. 265–270, No. 8, 11th April, 1954, in German.

Thermosetting Silicones

The authors survey the many types of silicone materials now used in the electrical industry, pointing out their special suitability for certain purposes and illustrating their survey by tabulated and graphed representations of the technically important characteristics of the individual types discussed. The combination of glass silk and silicone impregnant has become very important as insulation of motor and transformer windings. Other combinations (with glass, asbestos or mica) are used for slot linings, wedges, interlayers, shroudings, etc., and for the final impregnation silicone varnishes are used. Silicone rubber has largely replaced oil varnishes.

The higher dielectric strength of silicone insulations enables the designer to reduce, within certain limits, the sizes of machines and apparatus so insulated as compared with the sizes resulting from the conventional organic insulants. This refers particularly to special types of dry transformers (e.g. for mines), current transformers, etc. Particularly important are the excellent mechanical and thermal characteristics. The latter enable motors to be designed for up to 30 per cent thermal overloading, and as special types for use in high ambient temperatures, as flame-proof motors, etc. Other favourable features are the low hygroscopicity and excellent moisture-repulsion of the silicones and their chemical inertness.—"Thermosetting Silicones in the Electrical Industry," P. Nowak and E. Rickling, *Kunststoffe*, Vol. 44, No. 5, pp. 191–197, May 1954, in German.

Earth Faults

Medium-voltage systems with direct earthing of the neutral are subject to numerous breakdowns because every single-phase fault causes disconnection. Systems with Petersen coils are much less affected by disconnections, provided the number of two-phase faults is not excessive. It should not be overlooked that double earth faults are incomparably more dangerous than single faults and may cause serious breakdowns affecting large sections of a system.

The ratio of the number of double faults to simple faults increases as the square of the extension of the system, so there is a certain "safe" size of the system beyond which it is unwise to proceed. This may be obtained by subdividing the whole system into sub-systems, which effectively reduces the number of double faults. Oscillograms show that the surge phenomena accompanying short-circuits to earth are superimposed on the steady operating conditions and have to be taken care of by appropriate relay protection.

The author also presents some current and voltage oscillograms of "mixed" faults consisting of alternating simple and double faults. The correct evaluation of the oscillograms is of supreme importance for obtaining conclusive fault statistics and is therefore discussed with reference to many typical oscillograms, since there are cases in which a decision as to what kind of fault occurred is difficult to arrive at. This refers particularly to systems with long spur lines. Recommendations are made as to most suitable size of systems, fault location and correct statistical evaluation.—"Short-circuits to Earth, Single and Two-phase Earth Faults in Medium-Voltage Systems," F. Geise, *E.T.Z.* (*A*), Vol. 75, pp. 215–220, 11th March, 1954, in German.

Explosion-Proof Installations

A comprehensive report on the principles of testing for explosion safety applied by the German testing authority for electrical mining equipment is based on the different and officially recognized variants of protective designs, viz. "totally enclosed," "plate-protected," "oil-immersed," "ventilated," "increased safety" and "special construction." The first two types are not, strictly speaking, explosion-proof in the sense that they cannot cause explosions, but only that they can withstand explosions

Readers who require accurate full translations of any of the articles abstracted in this section can be put into touch with the translators who will supply them at current rates.—Editors, *Electrical Review*.

inside their casings and prevent these explosions from spreading to the outside.

The oil-immersed and ventilated constructions actually keep firedamp away from points at which sparking may occur. Oil-immersed gear must be explosion-safe even if the space above the oil level contains firedamp. " Increased safety " is suggestive of designs of a kind preventing any sparking danger at points where sparking is not generally expected to occur, but is just possible; it has therefore more to do with the basic design of the apparatus or machine, insulation, thermal and dynamic short-circuit safety of windings, resistances, busbars, etc., and with layout and mounting of terminals, etc., than with " positive " protection.

The " special constructions " are still in their initial development stage and refer at present more or less to circuit elements, such as lighting fittings, etc., which may be hermetically enclosed in glass or in which existing gaps may be filled with sand. All these designs are tested by the authority by the special methods stipulated in the VDE regulations 0170.—" Testing whether Electrical Installations are Explosion-proof," F. Hülsberg, *E.T.Z.* (*A*), Vol. 75, No. 5, pp. 136–140, 1st March, 1954, in German.

Series Capacitors

In a rural 10 kV distribution system supplying a relatively arid, sparsely populated area with only a few saw-mills and quarries as industrial consumers, the voltage drop in the main feeder reached at peak load periods 12 per cent or more. Of the possible remedies, viz. provision of a new feed point, reinforcement or doubling of the existing feeder, insertion of a regulating booster transformer, compensation by shunt or series capacitors, only the last solution was found to be technically and economically satisfactory. Even in primary costs, parallel capacitors are 2·3 times dearer than series capacitors. All other solutions are much more expensive to provide and operate.

The series capacitor plant eventually constructed is described in detail and its thoroughly satisfactory operation since October, 1952, is reported. Particularly simple and successful was the surge protection of the capacitor bank by a specially designed spark gap shunted across the capacitors, taking care of all kinds of surges, whether due to short circuits or to switching operations. The voltage at the receiving end remains practically exactly the same as at the sending end, with the added advantages of improved p.f. and reduced transmission losses.—" Use of Series Capacitors for Maintenance of the Voltage in a 10 kV Rural Distribution System," F. J. Mäckel and E. Waldmann, *Elektrizitätswirtschaft*, Vol. 53, No. 7, pp. 177–183, April 1954, in German.

Surge Divertor Earthing Systems

This paper, read at the Lugano International Meeting on Lightning Protection, 1953, comprises theoretical and illustrative parts, the first of which is prefaced by a specification of the special conditions to be satisfied by divertor earthing systems, as distinct from service or machinery earthing systems. The design principles of earthings evolved are based on the modern types of earths combining buried plate and rod or tube-shaped electrodes (horizontal) with " driven " tubular electrodes or " diffusors," and in some cases occupying several levels.

The author also tries to balance technical against economic advantages. It should not be overlooked that his considerations apply to regions of exceptionally high thunderstorm incidence and also to difficult soil conditions where shallow structures might be worse than useless. The theoretical part is amply supplemented by experimental data. The illustrative section, apart from showing quite a number of practical solutions for aptly selected cases of installations protected according to modern conceptions (particularly by Melsen's network system), also contains short theoretical aids for design of overhead protection by earth wire systems with diagrams reducing calculation work.—" Design Principles of Surge Divertor Earthing Systems and Modern Overhead Lightning Protection for Industrial Plants, Transformer Substations and Radio Links at High Altitudes," G. Lombardo, *Elettrotecnica*, Vol. 41, No. 3 bis, pp. 150–163, April, 1954, in Italian.

Rectifier Fault Conditions

The calculation of d.c. short-circuit and arc-back currents for powerful rectifier installations is a problem as important as it is difficult. The first follows from the fact that these currents may reach 100 kA and the second from the intricacy of the rectifier-transformer circuits and the many, partly unknown, parameters jointly determining the magnitude of these currents. An exact solution is possible only in the simplest cases (not considering the modern, elaborate installations) and the methods actually used in practice are therefore of a more or less empirical character.

The author presents a partly novel approach to the problem, based on a systematical analysis of the d.c. short circuit (sustained, and transitory or intermittent) and arc-back. He considers the effect of the transformer reactance, that of the instant of arc-back inception, simultaneous arc-backs, backfiring under a.c. and under d.c. supply, and with simultaneous a.c. and d.c. supply, the role of the interphase transformer, and recovery voltage across the anode circuit breaker. A fully worked example is given of the calculation of the arc-back currents in a rectifier unit with a 12 MVA transformer and two theoretical appendices supplement the very comprehensive treatment of the problem.—" Fault Conditions in the Operation of Rectifiers," B. Heller, *Elektrotech. Obz.*, Vol. 43, No. 5, pp. 226–243, May 1954, in Czech.

Leakage Resistance Determination

The author recalls the principles of the two known methods of determining the leakance conductances of a three-wire three-phase system with earthed neutral and of negligible capacitance by measuring the p.d. between each wire and earth, and deducing the required conductances either by Mauduit's graphical or Tessie-Solier, Sido and Yquivel's algebraical method. He then goes on to show that the second method is based on the assumption of symmetrical phase voltages and a measurement of the actual p.d. between neutral point and earth which he proves to be really redundant and only introduced for greater convenience of the calculation. Hence he shows a simplification of the second method by substituting an improved graphical method for it which yields the required result more directly and conveniently since it can be carried out by a nomogram similar to the one used for finding the symmetrical components of a three-phase system with zero sum of the components.

Two new solutions are also found for a system the capacitance of which is no longer negligible. The author does not omit to stress that any useful method, whether graphical or algebraical, of the last-mentioned problem requires a certain amount of preliminary computation work the results of which would be seriously affected by any, even small, measuring error if the total capacitance of the system with respect to earth approaches the order of 1μF.—" Experimental Determination of the Leakage Resistances of a Three-Phase System without Interruption of the Service," E. Rouelle, *R.G.E.*, Vol. 38, pp. 96–104, February 1954, in French.

FOOD MIXER PRODUCTION

Woking Company's Rapid Expansion

Drilling, etc., of the castings has recently been expedited by the installation of a new line of six high speed multi-drilling machines

IN January, 1946, Mr. Kenneth M. Wood with a capital of £800 and one assistant opened small premises in Goldsworth Road, Woking. To-day he is managing director of Kenwood Electrics, Ltd., a company with 400 employees and a turnover of £1½ million a year. The first item manufactured was a toaster but soon production was concentrated exclusively on food and drink mixers, the company now claiming to be by far the largest manufacturer of this type of equipment in the country. Between 60 and 70 per cent of its output goes for export, the United States and Canada being among the best markets. Only import restrictions limit sales to South Africa and Australia. Germany is among European buyers.

The present factory, into which the company moved five years ago, now has a floor area of 26,000 sq ft including a new block just being completed for the production of the new " Steam-o-matic " steam iron, to which we shall refer again later. An additional 4½ acres of ground are still available for further expansion.

The works are largely self-supporting, the only components not being manufactured on the premises being the aluminium alloy castings, the plastic mouldings and the Delco ¼ h.p. 10,000 r.p.m. motors.

The layout of the main factory block is arranged with the machine shop at one end and the assembly department at the other with the control offices between. The castings, received straight from the foundry, have first to be scurfed and cleaned. Recently later operations on the castings have been considerably accelerated by the installation of a new line of six high speed multi-drilling machines. Various automatic or semi-automatic machines produce many of the components and accessories required. All the gears used are cut in the machine shop, both " Tufnol " and

The motor and control assembly line

Completing the assembly of the mixers and (right) with final components added the mixers are greased and given a ten minutes' test run

Final inspection and packing of a "Kenmix" liquidizer

metal, a small case-hardening shop being provided for finishing the latter. Besides possessing paint spraying facilities the company also has a well-equipped plating department.

Instead of running lengthwise down the shop, the assembly lines have recently been split up and re-arranged to run across the floor, one dealing with juice separators, potato peelers, etc.; another with the "Kenmix" liquidizer; a third with the motor and control unit; and a fourth with the final assembly of the mixers. In addition to these main assembly lines there are a number of other short sub-assembly lines.

A governor type controller gives infinitely variable motor speed regulation while condensers provide for arc and radio interference suppression. Arriving at the final assembly line the tested motors and control units are inserted in the body castings (now white cellulose sprayed) together with the gears and are inspected for alignment, etc. With final components added the units are greased and given a five minute test run in gear followed by a similar period declutched. After a final inspection the mixers are packed ready for dispatch.

The completed mixers are among the most versatile on the market for besides being suitable for mixing, mincing, shredding, whisking, and beating, with appropriate attachments they can be employed for juice extraction, liquidizing, can opening, coffee and nut grinding, potato peeling, etc. Hitherto production has been concentrated almost entirely on the standard "Chef" mixer and the "Kenmix" but considerable numbers of the portable "Minor" mixer are now being made and the manufacture has just commenced of the "Major" machine which has a mixing capacity of 6½ qt compared with 3 qt for the standard machine.

The new "Steam-o-matic" iron, on which large-scale production has just started, is being made under licence to a design which has already proved its efficiency and reliability in America. Incorporating a 1,000 W element and requiring no special water filling device, it is quickly ready for use, immediate change-over from dry to steam being possible. It is comfortable to use and weighs 3 lb empty.

The company devotes a great deal of attention to research and in addition to a drawing office has separate departments devoted to design, development and prototype work.

Next Winter's Load

THE report of the Electricity Sub-Committee of the Joint Consultative Committee on load spreading next winter was published last week (H.M. Stationery Office, 4d). As announced by Sir Walter Monckton, Q.C., Minister of Labour and National Service, in the House of Commons on 29th July the Government has accepted the Sub-Committee's recommendations.

The Sub-Committee's main recommendation is that, as last year, Regional Boards for Industry should have discretion to make load spreading arrangements in the light of the conditions likely to arise in their respective areas. For this purpose the Load Spreading Committees of the Regional Boards should remain in being. The Sub-Committee also recommends the continued encouragement of the use of private generating plant during winter peak hours, and a general appeal for economy to domestic and small commercial consumers at the beginning of the winter. Peak hours are again defined as 8 a.m. to 12 noon and 4 p.m. to 5.30 p.m., Monday to Friday.

During last winter load-shedding by disconnection of supplies was necessary for a short period on one occasion only, compared with nine occasions during the previous winter, but some reduction in voltage and frequency was also necessary. There has now been a further material improvement in the prospective demand and supply position during "average cold spell" weather over the country as a whole. In the Glasgow and Bristol grid control areas, however, where the position is least favourable, it may be necessary to make special arrangements for reducing demand. As in past years the Sub-Committee has not based its recommendations on the assumption of severe weather conditions. In its view the disconnection of supplies which such conditions would entail is a risk which should be taken if industry and commerce are not to be unduly hampered.

The Electricity Sub-Committee consists of representatives of employers and employees in industry, the British Electricity Authority, and the Government Departments concerned.

Bhakra-Nangal Project

LAST month the Prime Minister of India (Mr. Nehru) inaugurated the Bhakra-Nangal project which is a power and irrigation scheme in the Punjab involving an extensive canal network to irrigate 6 million acres of land. A large dam has been constructed in the Sutlej River 680ft high, 1,700ft across and 625ft wide at the top. The Nangal Canal will serve two power houses, each with an initial installation of 48 MW with provision for a further 24 MW set. These plants will be connected to the existing Mandi grid by 132 kV lines. The first station is expected to be put into service shortly and the second is scheduled to go into operation towards the end of next year.

Financial Section

STOCKS and SHARES

HOLIDAY influences mingled with international affairs to produce relatively quiet Stock Exchange conditions at the start of the month. Gilt-edged stocks came back to below their recent best, but the reaction looked small in comparison with the extent of the preceding rise. Industrials have shown some signs of irregularity. In the electrical groups, the recent "rights" issues by the Pye and Broadcast Relay Service companies monopolized a good deal of attention. Premiums on these issues were respectively about 6s 6d and 14s 9d. General Electrics held the rise which had followed the announcement of the increased dividend and earnings. Thorn Electric 5s shares went ahead to 22s 9d after news of the raising of the ordinary distribution from 12½ to a still very well covered 20 per cent. Group trading profit has risen by about a third to over the million mark. Parnall (Yate) rose sharply to 8s 6d.

G.E.C. Report

It appears from the General Electric Company's full report that the 26 per cent expansion in the group trading profit occurred through a larger turnover of goods in both the consumer and capital classes, and despite a general narrowing of profits margins. It is confirmed, also, that the excellent results, and the increase in the year's dividend from 11¼ to 12½ per cent, owed a good deal to the improvement on the side of consumer products, in which G.E.C. is commonly regarded as being more extensively engaged than are other of the big electrical engineering groups. Concerning the outlook, the report refers to a satisfactory order book at the end of the latest period, but to increasing pressure of foreign competition, affecting particularly the capital goods. The Company's £1 shares, which stood at 43s 9d a month ago, show a yield of approximately 5 per cent at 50s cum-dividend.

Electricity Stocks

Unlike industrial ordinary shares, Government securities still stand well below the price levels recorded in the ultra-cheap money days of 1946/47, but considerable strides have been made this year to narrow the gap. All four of the major British Electricity Authority issues, for instance, have advanced this year by about 6 points, and the two junior stocks are now worth more than the prices at which they were originally issued. In the case of the 4¼ per cent stock 1974/79, the present quotation of over 109 compares with the price of 100 at which a second block of £125 million was issued only sixteen months ago. The 3½ per cent stock 1976/79, now standing at 100, came out in 1950 at a discount of 1 point. As regards, however, the 3 per cent issue of 1968/73, the present quotation is still nearly 5 points under the price of 100 on the basis of which it was originally allotted in 1947 as compensation to dispossessed holders of the nationalized electricity undertakings.

Gilt-Edged Yields

The rise in gilt-edged stock prices has reduced current yields on the two senior 3 per cent British Electricity stocks to less than 3¼ per cent. Being quoted approximately 5 points below par, they offer the present buyer a capital profit of that amount upon their eventual repayment, and allowing for this the so-called redemption yield is nearer 3½ per cent. On the 4¼ per cent stock at 109½ the running yield is only 1s or so under £4 per cent, but the prospective loss of the 9½ points premium at repayment time, reduces the redemption yield to under 3¾ per cent. The present quotation of the 3½ per cent stock 1976/79 at about 100 suggests that when the time comes for B.E.A. to raise further capital (the market has been expecting news of an issue for some time now) they will be able to borrow at a rate of interest much below the 4¼ per cent at which their last loan was negotiated.

Dubilier Results

After three successive increases, the annual dividend on Dubilier Condenser 1s shares is being maintained this time at the previous rate of 25 per cent. It remains in the highly conservative class, and the Company proposes in addition a one-for-four share distribution. Trading profits for the year ended last March contracted, but the difference was largely ironed out by smaller tax provisions, although the latter still included £33,000 (substantially more than the net amount of the dividend) for the Excess Profits Levy. In the outcome, the net surplus of £110,400 is within £2,600 of the previous figure, and again represents earnings of well over 100 per cent gross on the £172,000 ordinary capital. Quoted at 5s 4½d after news of these results, the 1s shares show a yield of nearly 4¾ per cent.

Preference Shares

Top-grade preference shares currently offer the investor yields of 4½ to 5 per cent. At or about the lower end of that range are such issues as I.C.I. new 5 per cents at 22s (free of stamp), G.E.C. 4¼ per cent preference at 19s 3d, English Electric 3½ per cents at 17s and B.I.C.C. 5½ per cents at 24s 3d. Returns of around 4¾ per cent have been available from, among others, Telegraph Construction and Hackbridge Cable 5 per cents, both on offer recently at 20s 9d, Plessey 5½ per cents at 23s and from Crompton Parkinson "sixes" at 25s. Shares showing yields of 5 per cent or over include Cossor "sixes" at 20s 3d, National Electric Construction "fives" at 19s 4½d, and Brush 5½ per cents at 19s 3d. Recently issued Johnson & Phillips 4½ per cent preference shares are available at 19s 4½d (free of stamp) to yield £4 13s 0d per cent.

Globe Telegraph & Trust

An increase of 1 to 9 per cent in the Globe Telegraph & Trust total dividend for 1953/54 came close to expectations, and the price of the £1 shares was quoted subsequently at 40s 6d. Net revenue is reported to have expanded by about 20 per cent. Capital issues are proposed by this Company, and also, more immedateily, by Cables Investment Trust, whose ordinary capital is held jointly by the Globe and Cable & Wireless (Holding) companies. All three are under the chairmanship of Sir Edward Wilshaw. Cable Investment intends to place a million 4 per cent loan stock, and to offer 50,000 of the £10 ordinary shares for cash at par to the two existing ordinary shareholders. Globe Telegraph expects to be raising fresh capital by the end of the year.

Current Trade

At the annual meeting held towards the end of last month, the Walsall Conduits' chairman reported that sales in the first five months of the current year had exceeded last year's corresponding figures. With a full order book, he looked forward with confidence. He reviewed a year in which a re-expansion of trading profits was more than offset by increased tax provisions; the rate of the ordinary dividend was again 70 per cent (paid from earnings equivalent to 128 per cent on the capital). On that basis the 4s shares at 51s 3d pay about 5½ per cent on the money. At another annual meeting held on the same day, the chairman of Rothermel Corporation reported a 10 per cent increase in turnover this year to date. Resolutions were passed changing the name of the firm to Motor and Electronics Corpn. At 3s 1½d the 1s ordinary shares give a yield of 7¼ per cent on the distribution as increased this year to 22½ per cent.

INCREASES OF CAPITAL

Telegraph Condenser Co., Ltd.—Increased by £300,000, in 10s ordinary shares, beyond the registered capital of £580,000.

Superheater Co., Ltd.—Increased by £250,000, in 170,000 ordinary and 830,000 "A" ordinary shares of 5s, beyond the registered capital of £750,000.

Telephone & General Trust, Ltd.—Increased by £600,000, in £1 ordinary shares, beyond the registered capital of £1,650,000.

REPORTS and DIVIDENDS

The General Electric Co., Ltd.—The report and accounts for the year ended 31st March last now published, show a consolidated profit on trading of £8,264,047, as compared with £6,519,615 for the preceding year, to which is added investment income of £192,145, making £8,456,192. From this are deducted the following :— Depreciation, £1,300,056; directors' remuneration, including remuneration as executives, £128,401; contribution to pension fund, £443,739; provisions for unascertained liabilities, £507,367; loan interest, £285,212; and remuneration of auditors of holding company, £13,500. The profit, before taxation, is therefore £5,777,918 (against £4,230,234), and after providing £3,053,711 for United Kingdom taxation, £302,396 for overseas taxation and £57,466 profit attributable to minority shareholders in subsidiary companies, the consolidated net profit for the year is £2,364,345 (£1,266,054). After adding £3,595,942 brought in, £143,335 provisions no longer required, £250,227 other income, and £75,261 (£2,710,979) United Kingdom taxation refunded, the total available is £6,429,110 (£6,914,725). Of the consolidated net profit £2,203,519 (£1,196,834) is dealt with in the accounts of the holding company, and with net income relating to previous years of £266,730 and £2,102,271 brought in, the balance available in the holding company's accounts is £4,572,520. As we have already reported, general reserve receives £976,546 and reserve for increased cost of plant replacement, £250,000. The proposed final ordinary dividend is 8¾ per cent making 12½ per cent for the year (against 11¼ per cent), and the balance carried forward is £2,352,437.

The report states that the improvement in the profit is mainly due to the increased turnover achieved both in capital and consumer goods, but profit margins had to be reduced in many cases for both classes of goods. At home and abroad it was found impossible to recover the increased costs resulting from the wage advances granted in the engineering industry. In addition, in overseas markets the ever increasing competition of countries with lower wage standards and longer working hours had to be met. The order book at the end of the financial year was still satisfactory, but the future outlook, particularly as regards capital goods, is increasingly affected by foreign competition. The improvement in the demand for consumer goods has been maintained at home on account of the lifting of the ban on sales promotion. This has materially helped competitiveness in the overseas markets. Total shipments abroad created a new record. The trading of overseas companies has, with a few exceptions, encountered difficult conditions and increased competition, resulting in decreased profits. In spite of the increase in turnover, a considerable reduction in stocks and work-in-progress has been effected and, consequently, there is an improvement of over £3 million in the cash position. The annual meeting will be held on 23rd September.

Pirelli-General Cable Works, Ltd., reports a profit for the year to 31st March last of £1,274,147, as compared with £1,879,782 for the previous year, and after deducting £665,259 for taxation, the net balance is £608,888 (£810,043), to which is added E.P.L. recoverable of £40,000. Reserve for contingencies receives £50,000 and general reserve £200,000. It is proposed to pay a dividend for the year of 8 per cent and a bonus of 12 per cent (unchanged).

Lightfoot Refrigeration, Ltd.—In the course of his speech at the annual meeting held on 28th July, Major C. P. N. Raikes (chairman) said that the reduction in the trading profit was mainly attributable to two things; firstly, to the large proportion of the year's output of refrigerating plants that was exported, and secondly, to the falling off in the sale of frozen confections by some of the subsidiary companies. The value of refrigeration plant of all kinds delivered and invoiced during 1953 showed an increase on the preceding year. Of this rather more than 50 per cent was exported, which had the effect of reducing the total profit on the sales of machinery, as the margin obtainable on export orders was, to a large extent, limited by international competition. During the latter part of 1953 a general falling off in the home orders placed for commercial and industrial refrigerating plant was experienced, and although there had been some improvement in the last four months, the volume of unexecuted orders on the books brought into 1954 was substantially less than that which was brought into 1953.

Vactric, Ltd.—The annual meeting was held on 27th July, Sir Frederick Whyte (president) presiding. In his circulated statement, Sir Frederick said that the profits earned had enabled all arrears of the preference dividend to be paid and to reinforce the sinking fund. The board was also satisfied that the proposed ordinary dividend of 10 per cent was justified.

Hick, Hargreaves & Co., Ltd.—The annual meeting was held on 28th July, Mr. W. D'Arcy Madden (chairman and managing director) presiding. In presenting the report and accounts, the chairman said that the works had continued in full production throughout the year and were fully occupied with a heavy order book which exceeded £4 million sterling, including condensing plant and feed heating contracts for the British Electricity Authority for commissioning up to the end of 1958. The heavy bay extension to the engineers' shop would be in commission by the end of this year and would permit the handling of contracts for the large condensing plants of 120 MW and 200 MW which would be required by the B.E.A. in the near future. Orders had been received for auxiliary equipment in connection with the first atomic power station for this country.

The Dubilier Condenser Co., Ltd., reports a trading profit for the year to 31st March last of £353,000, as compared with £419,639 for the preceding year, and after providing £180,185 for taxation, the net profit is £110,429 (against £113,009). General reserve receives £77,906, and it is proposed to maintain the dividend for the year at 25 per cent. The directors propose to capitalize £43,102 and to make a one-for-four scrip issue.

The Globe Telegraph & Trust, Ltd.—The profit, after taxation, for the year to 30th June last is £275,370, as compared with £230,645 for 1952–53. The dividend for the year is raised to 9 per cent (against 8 per cent) by a final payment of 6 per cent. The directors have under consideration the question of the issue of further shares to stockholders and an announcement is contemplated before the year end.

The Cables Investment Trust, Ltd.—The net profit for 1953–54 is £229,223, as compared with £212,780 for the previous year. It is proposed to pay a final ordinary dividend of 6 per cent, making 9 per cent for the year (against 8 per cent). It is also proposed to increase the capital by £5,000,000 by creating 100,000 ordinary £10 shares and to offer 50,000 shares to existing stockholders, and to place privately £1,000,000 of 4 per cent unsecured loan stock, 1967–69.

Thorn Electrical Industries, Ltd., state that the group trading profits for the year ended 31st March last amounted to £1,054,348 (compared with £771,292 in the previous year). Deducting all charges, including depreciation of £206,42[illegible] (£148,688) and taxation of £462,7[illegible] (£324,173), the net profit is £315,5[illegible] (£223,259) subject to completion of audit. A dividend on the ordinary shares of 20 per cent (against 12½ per cent) is recommended.

New Companies

Wilfred Fairburn, Ltd.—Registered 12th June. Capital £2,500. To acquire the business of an engineer and electrical contractor heretofore carried on by Wilfred Fairburn at 244, Spring Bank, Hull. Directors: W. Fairburn, Evelyn Fairburn, E. G. Ashton and G. Fairburn. Regd. office : 244 Spring Bank, Hull.

John Lightfoot, Ltd.—Registered 15th May. Capital £1,000. To acquire the business of an electrical engineer carried on by John J. Lightfoot, as "John Lightfoot," at 195, Upper Richmond Road, Putney, S.W.15. Directors: J. J. Lightfoot and Florence P. Lightfoot. Regd. office: 195, Upper Richmond Road, S.W.15.

Duigman & Hall, Ltd.—Registered 19th May. Capital £100. Importers, exporters and dealers in electrical washing and cleaning machines and electrical apparatus and appliances of all kinds, etc. Directors: J. R. Duigman and T. J. Hall. Secretary: Thomas J. Hall. Regd. office: 136, North Hill Drive, Harold Hill, Romford.

Provincial Rentals, Ltd.—Registered 18th May. Capital £15,000. Manufacturers, dealers, merchants and hirers of radio receivers and transmitters, television receiving sets and transmitters, electrical apparatus, etc. Subscribers: C. S. Field and E. H. House. Regd. office: College Hill Chambers, Cloak Lane, E.C.4.

Jesse Hill, Ltd.—Registered 19th July. Capital £17,500. To acquire the businesses of Davis & Hill and the Vulcan Motor Co., both of Pritchett Street, Birmingham, and to carry on the business of manufacturers of and dealers in gas, electrical and water meters and gas, electrical and water appliances of all kinds, etc. Directors: Jesse C. Hill and Mrs. Marjorie H. Hill. Regd. office: 56 60, Pritchett Street, Birmingham, 6.

Electronics (Lincolnshire), Ltd.—Registered 20th July. Capital £100. Manufacturers of precision electronic equipment for communications, industrial and domestic purposes, etc. Directors: J. A. Porter, J. B. Leigh and F. C. Drury. Regd. office: 106, Cleethorpe Road, Grimsby.

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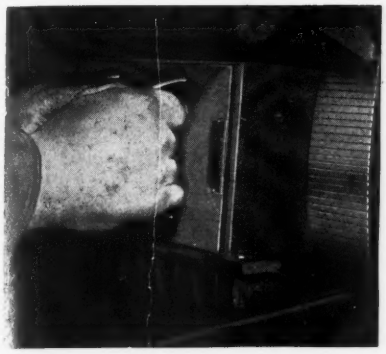

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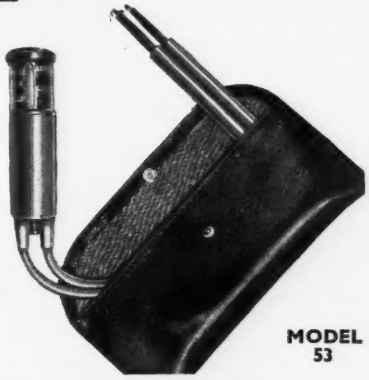

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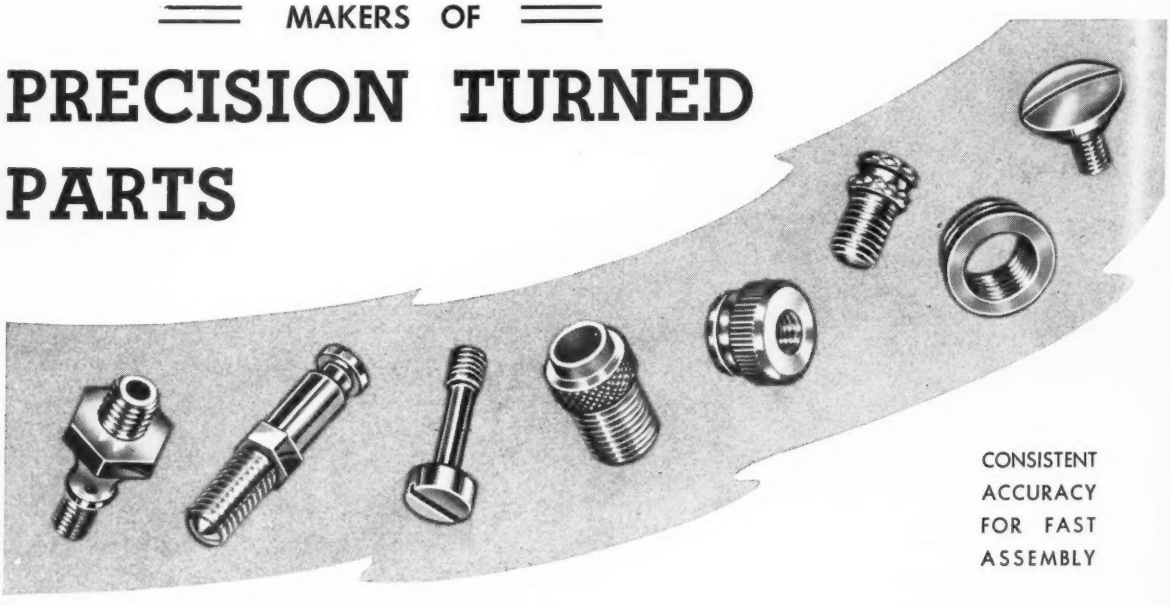

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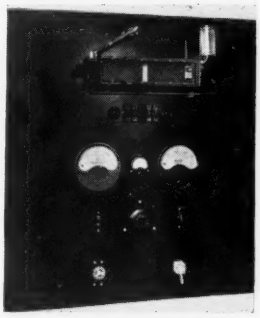
NEW ELECTRICAL EQUIPMENT

Carburizing Quality Measurement

An instrument for measuring the quality of a carburizing atmosphere has been developed by the GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, London, W.C.2. It consists essentially of a compartment (with a transparent front) inside which is an iron wire which is carburized



G.E.C. instrument for measuring the quality of a carburizing atmosphere

in the atmosphere under test and cooled rapidly so that it is transformed to martensite. In this condition the electrical resistance of the wire is a measure of its carbon content and hence of the carburizing potential of the atmosphere. Values of the electrical resistance of the quenched wire can be directly related to carburizing potential from a calibration curve. Operation of the gauge is straightforward and one measurement takes about 15 min.

The carburizing potential measured on the G.E.C. carbon gauge is the carbon content of a steel with which the atmosphere would be in equilibrium at a given temperature. For example, if the carburizing potential of an atmosphere is measured on the gauge as 0·65 per cent carbon steel then this atmosphere would be neutral to a 0·65 per cent carbon steel at the same temperature.

A panel-mounted carbon gauge is illustrated, but where the instrument is required for use on several furnaces it can be supplied as a portable unit. The gauge wire runs through the compartment seen at the top of the panel. The carburizing gas passes through this compartment and is burned as it emerges from the nozzle on the right. Heating current through the wire is adjusted by a "Variac." For measuring the resistance of the gauge wire after carburizing, the voltage developed across it is measured for a small known value of current. The carburizing potential of the gas can then be read off from the calibration chart.

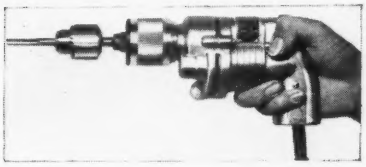
Mining Drill Units

The flameproof mining drill units manufactured by the METROPOLITAN-VICKERS ELECTRICAL CO., LTD., Trafford Park, Manchester, 17, have been modified to conform to the new safety requirements of the Ministry of Fuel and Power. These units comprise the transformer pattern (type MDU32) for two 50 c/s drills and the frequency-changer pattern (type MU12) for two 150 c/s drills. Protective features now include an electrical lock-out circuit of the intrinsically-safe type, which effectively locks out the drill contactors until the earth fault is removed, and a certified intrinsically-safe low-voltage pilot control circuit (M. of F. & P. Certificate No. T/RC53) for each drill. In each drill circuit also overcurrent protection is provided by an instantaneous latch-out magnetic relay, and overload protection by a self-resetting thermal induction relay.

Portable Electric Tapper

A comparative newcomer to the range of electric tools manufactured by DESOUTTER BROTHERS, LTD., The Hyde, Hendon, N.W.9, is a portable electric tapper.

The action of pushing the tool against the work automatically engages the forward drive and when the tool is withdrawn the chuck spindle slides into



Desoutter portable electric tapper

engagement with a reverse drive which runs at twice the forward speed.

Two types are available, the T.45 ($\frac{5}{16}$ in capacity) and the T.80 ($\frac{1}{2}$ in capacity) and the respective speeds are 450 r.p.m. and 800 r.p.m. Suitable for use on a.c. and d.c., the weight of the tool is 4 lb and the price £23 3s.

Direct Reading Polarograph

To meet the demand for a less expensive instrument where the volume and scope of the analytical work does not warrant the outlay for the larger recording instrument EVERSHED & VIGNOLES, LTD., Acton Lane Works, London, W.4, have introduced the "Tinsley Polarograph Minor." Although non-recording it retains many features of the larger model including the derivative circuit; this inclusion is made possible by the use of a motor-driven potentiometer, and the "Minor" is the only non-recording polarograph to have this important circuit. The derivative circuit is used to identify substances which fall close together on the potential scale, by giving more distinct readings and hence increasing the sensitivity of the method. With this polarograph it is possible to detect changes in current of 100 $\mu\mu$A; the amplification is achieved without the use of any thermionic valves or additional attachments.

"Tinsley Polarograph Minor"

Fluorescent Lamp Starter

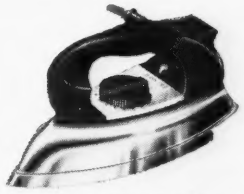
When a fluorescent tube has lost its filament emissive properties it will continue to glow and blink at the ends until the starter burns out or the tungsten filaments of the tube evaporate to the point of collapse. In the case of the normal 80 W 5ft lamp the current at this time is in the region of 1·3 A, whereas the normal working current is below 0·5 A.

An improved type of fluorescent lamp starter just produced by E. J. DAWES, LTD., Erimus Works, Stockton Street, Middlesbrough, is designed to overcome this wastage. It contains a small cut-out switch within the canister which automatically opens the circuit to the tube filaments when they lose their emissive properties, thus preventing any further starter operations and tube blinking. When the tube is replaced the starter automatically resets itself.

The starter, which is suitable for a voltage range of 200/250 V, costs 12s.

Automatic Iron

The "Super-Smoothwell" automatic electric iron (Catalogue No. 835) made by PREMIER ELECTRIC HEATERS, LTD., Keeley Street and St. Andrews Road, Birmingham, 9, is designed on modern lines with large comfortable grip handle and easily set heat selector dial. It weighs 5 lb, is fitted with a snap action thermostat and indicator light, and has a rating of 750 W. Finished in chromium plate, its price is 45s. It is packed in a colourful box and bright coloured counter stands are available for retailers' use.



Above: Premier "Super-Smoothwell" iron

Below: Dawes safety fluorescent lamp starter

NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (2s 8d each including postage) will be obtainable after 15th September from the Patent Office, 25, Southampton Buildings, London, W.C.2.

1949

23082. Postmaster General. — Electrical communication switching systems. 21st August, 1950. (715461.)

1950

6097. Sperry Corporation. High-frequency apparatus. 10th March, 1950. (715463.)

7009. Sperry Corporation. Resonant-space resonators for high-frequency apparatus. 21st March, 1950. (715464.)

17841. Metropolitan-Vickers Electrical Co., Ltd.—Electric fluorescent lighting systems. 4th July, 1951. (715466.)

23093. General Electric Co., Ltd., and Williams, C. E.—Variable inductive elements having saturable cores. 20th September, 1951. (715610.)

1951

4052. English Electric Valve Co., Ltd.—Magnetrons. 17th December, 1951. (715472.)

7871. Bates, E. B.—Electrode boiler. 7th July, 1952. (715615.)

11992. Siemens-Schuckertwerke Akt.-Ges. —Electric coils with formers made from ceramic materials for use at high-frequencies. 22nd May, 1951. (715475.)

14559. British Dielectric Research, Ltd.—Electrolytic capacitors. 18th June, 1952. (715525.)

14572. Soc. d'Electronique et d'Automatisme. Reproducing servo-mechanisms. 19th June, 1951. (715621.)

15060. Sangamo Weston, Ltd.—Electrical measuring and like instruments in hermetically sealed casings. 18th April, 1952. (715388.)

16367. General Electric Co., Ltd., Leng, T. R., and Morris, F. H.—Electric incinerators. 10th July, 1952. (715623.)

16576. British Thermostat Co., Ltd.—Expansion valves. 25th June, 1952. (715328.)

17183. Metropolitan-Vickers Electrical Co., Ltd.—Electric-discharge tubes. 28th May, 1952. (715479.)

17194. Cossor, Ltd., A. C.—Adjusting knobs for electric components. 8th July, 1952. (715526.)

18117. Inglesby, J. C. Vredenburg-, and Fries, G.—Record carrier for the recording of electronic images, and method of and apparatus for producing same. 31st July, 1951. (715480.)

18366. Compagnie Generale de Telegraphie sans Fil.—Electron-discharge devices. 2nd August, 1951. (715389.)

20405. Cinema-Television, Ltd.—Focus coils for electron-discharge devices. 28th August, 1952. (715482.)

22460. Cole, Ltd., E. K., and Coppin, K. J.—Electromagnetic change-over relays. 25th September, 1952. (715392.)

23019. Huebner Co.—Apparatus for electronographic printing. 3rd October, 1951. (715484.)

23037. Fries, G., and Inglesby, J. C. Vredenburg.—Method of and apparatus for recording pictures using cathode-rays. 3rd October, 1951. (715485.)

25163. Cole, Ltd., E. K., and Coppin, K. J.—Change-over relays. 27th October, 1952. (715395.)

25394. Loma Electronic Equipment, Ltd. —Apparatus for detecting the presence of bodies of electrically conducting or magnetic material. 30th January, 1953. (715396.)

26221. Telephone Manufacturing Co., Ltd., and Carpenter, R. E. H.—Adjustable permanent magnets. 27th October, 1952. (715630.)

26996. General Electric Co., Ltd., and Friedlander, E. S.—Liquid resistances and electric motor control equipment including such resistances. 11th November, 1952. (715340.)

28895. Marconi's Wireless Telegraph Co., Ltd.—E.h.t. systems. 9th October, 1952. (715489.)

30061. General Electric Co., Ltd., and Kirkness, R. H.—Electrical equipment of the kind adapted to provide an electric signal which is substantially proportional to the product of two quantities. 23rd March, 1953. (715344.)

30068. Electric & Musical Industries, Ltd. —Scanning kinematograph film for the purpose of generating or recording television signals. 19th December, 1952. (715635.)

30488. General Electric Co., Ltd., Douglas, R. W., and Ryde, J. W.—Manufacture of electrical amplifying devices.—12th December, 1952. (715398.)

1952

639. Ferranti, Ltd.—Reflectors for electric fires. 18th March, 1953. (715530.)

2763. Plessey Co., Ltd.—Gain control circuit means for line and radio telephony. 4th March, 1953. (715401.)

4012. General Electric Co., Ltd., and Kirkness, R. H.—Apparatus for amplitude modulating electric signals. 16th February, 1953. (715353.)

4090. English Electric Co., Ltd.—Electric fuse apparatus. 13th February, 1953. (715641.)

5084. Electrical Apparatus Co., Ltd.—Apparatus for protecting polyphase alternating current electrical apparatus and particularly polyphase electric motors. 1st January, 1953. (715502.)

5363. Western Electric Co., Inc.—Electrical conductors. 29th February, 1952. (715359.)

6197. British Insulated Callender's Cables, Ltd.—Manufacture of electric coupling devices. 9th March, 1953. (715649.)

6736. Standard Telephones & Cables, Ltd. —Electric signal responsive equipment. 14th March, 1952. (715651.)

7235. Siemens-Schuckertwerke Akt:-Ges. —Low oil-content electric power switches. 20th March, 1952. (715653.)

8279. Philco Corporation.—Colour television. 1st April, 1952. (715506.)

8908. McKay Machine Co.—Rotary electric resistance welder. 8th April, 1952. (715406.)

9531. Philips Electrical Industries, Ltd.—Amplifying circuits. 16th April, 1952. (715658.)

10440. British Optical & Precision Engineers, Ltd.—Electroscopes. 17th April, 1953. (715408.)

10684. Elmeg Elektro-Mechanik Ges. — Arrangements for the control of electromagnetic hammering or battering tools. 28th April, 1952. (715541.)

11411. Western Electric Co., Inc.—Electronic high frequency signal translating devices employing wave transmission circuits. 6th May, 1952. (715409.)

11790. Standard Telephones & Cables, Ltd.—Regulated rectifier power supply equipment. 1st May, 1953. (715660.)

12788. General Electric Co., Ltd., Briscomb, D. W., and Faithfull, P. J. F.—Electric-pulse generators. 20th May, 1953. (715662.)

13136. British Thomson-Houston Co., Ltd. —Measuring apparatus. 26th May, 1953. (715415.)

14820. Erie Resistor Corporation.—Electron-tube sockets. 12th June, 1952. (715554.)

15065. Allmanna Svenska Elektriska Aktiebolaget.—Induction type melting furnaces. 11th June, 1953. (715558.)

15609. Standard Telephones & Cables, Ltd. —Electro-acoustic transducers. 12th June, 1953. (715517.)

17019. Mechanical Products, Inc.—Electrical circuit breakers. 7th July, 1953. (715423.)

17050. Siemens-Reiniger-Werk Akt.-Ges. —Electro-medical apparatus, more especially an X-ray examination apparatus. 7th July, 1952. (715568.)

17316. General Electric Co.—Methods of making armatures for dynamo-electric machines. 9th July, 1952. (715569.)

18042. Siemens & Halske Akt.-Ges.—Filar suspension mountings for the rotors of measuring instruments, recording instruments, indicators or electrical switches or for relay armatures. 16th July, 1952. (715427.)

18388. Hewittic Soc. A.R.L.—Apparatus for converting direct current into alternating current. 21st July, 1952. (715428.)

18626. Tesla, Narodni Podnik.—Reciprocating electric motor. 23rd July, 1952. (715429.)

18815. Cathodic Corrosion Control, Ltd., Powell, H. M., and Spencer, K. A.—Anodes for use in the cathodic protection of metal objects. 24th July, 1953. (715665.)

18912. Belling & Lee, Ltd.—Multi-contact electrical plug and socket connectors. 25th July, 1952. (715574.)

20028. Automatic Electric Laboratories, Inc.—Means for controlling signal level in radio and line signalling systems. 8th August, 1952. (715435.)

21422. Standard Telephones & Cables, Ltd. —Radio telegraph diversity receiving systems. 26th August, 1952. (715438.)

21573. English Electric Co., Ltd.—Electric motor control systems for mine winders and the like. 14th August, 1953. (715583.)

23030. Turnhout, M. Van, Turnhout, L. Van, and Turnhout, J. Van.—Installations for electric wiring. 12th September, 1952. (715587.)

24343. General Electric Co.—Methods of obtaining vacuum tightness in X-ray tubes. 29th September, 1952. (715669.)

24958. Compagnie pour la Fabrication des Compteurs et Matériel d'Usines à Gaz.—Electronic pick-up tubes. 6th October, 1952. (715447.)

25686. United States Rubber Co.—Method of making embossed electric battery separators. 14th October, 1952. (715448.)

25764. Sick, E.—Protection by electromagnetic waves. 14th October, 1952. (715444.)

29647. Naamlooze Vennootschap Philips' Gloeilampenfabrieken.—Thermal regenerators. 24th November, 1952. (715594.)

30759. Tudor Accumulator Co., Ltd.—Electric accumulators. 28th September, 1953. (715596.)

30927. Philips Electrical Industries, Ltd.—Electrical coil systems. 5th December, 1952. (715456.)

32264. Research Corporation.—Electrode rapping systems in electrical precipitators. 19th December, 1952. (715599.)

32445. General Electric Co.—Pressure differential valves. 22nd December, 1952. (715600.)

32956. Electrolux Corporation.—Suction cleaner nozzles and an attachment therefor. 30th December, 1952. (715604.)

33090. Siemens-Schuckertwerke Akt.-Ges. —Cascade set of two asynchronous motors. 31st December, 1952. (715605.)

GENERATION AND DEVELOPMENT

B.E.A. Contracts

Contracts have been placed by the British Electricity Authority during the past month for power stations and transmission lines, amounting in the aggregate to £3,566,800. The principal contracts include the following:—

Acton Lane "B" power station, Willesden: Two 240,000 lb/hr boilers.—Mitchell Engineering, Ltd.

Castle Donington station, near Derby: High pressure pipework and valves.—Aiton & Co. Ash and dust handling plant.—Babcock & Wilcox.

Willington "A" station, near Derby: One 300,000 lb/hr boiler.—International Combustion, Ltd. Circulating water valves.—J. Blakeborough & Sons.

Lincoln station: Two 25 MVA generator transformers.—Crompton Parkinson.

Nottingham station: High pressure pipework and valves.—Aiton & Co.

Mexborough station, Yorks: Civil engineering works.—Robert M. Douglas (Contractors), Ltd.

Barony station, Ayr: Coal handling plant.—Babcock & Wilcox.

Stella West–Blyth: 275 kV overhead lines.—British Insulated Callender's Construction Co.

Objection to Agecroft Extension

Swinton Council is recommending the Lancashire County Planning Committee to oppose the plan for a £15 million extension to the Agecroft power station, at Pendlebury, on the ground that the existing station creates a nuisance by the discharge of grit.

B.E.A.'s Water Power Plans

Local authorities in North Wales have been asked to meet representatives of the British Electricity Authority to hear details of the Authority's proposals for water power development in the area which are to be the subject of a Parliamentary Bill for next session. The schemes are one on the Rheidol River, Cardiganshire—a revision of an earlier proposal—and a pumped storage scheme at Blaenau Festiniog.

Electricity-Gas Co-operation

On 16th July an event took place which is believed to be without precedent in the history of electricity supply in this country, when a British Electricity collier was berthed as a routine procedure at a gas works wharf to discharge its coal for electricity generation at the adjacent power station. This occurred at a recently completed wharf in the River Medina at Cowes in the Isle of Wight. The wharf is part of a new gas works being constructed immediately adjacent to the existing electricity generating station, which is itself now being extended. The two nationalized industries have combined so that only one wharf is being constructed for the two works, and the common belt conveyors carrying coal from vessels can discharge either to the gas works or to a second belt conveyor which travels to the bunkers of the electricity generating station.

Although the gas works will not be in commission for, it is understood, about 2½ years, the need for the wharf for electricity purposes is immediate, and this part of the equipment has therefore been completed ahead of the rest of the gas works. Previously coal was brought to the electricity works in barges taken across the Solent from the Portsmouth generating station.

To mark the occasion of the arrival of the first collier, the s.s. *Polden*, at this wharf, the ship was joined at Spithead by Mr. W. K. Tate, general manager of the Southern Gas Board, Eastern Division, and this year's president of the Institution of Gas Engineers; Mr. A. S. Bean, marketing manager, National Coal Board, Durham Division; and Mr. Douglas Cory-Wright, deputy chairman, Wm. Cory & Son, Ltd. (ship's managers), in company with the divisional controller, Mr. R. H. Coates, and other senior officers of the Southern Division, British Electricity Authority. After the collier's arrival at Cowes, she was joined by Mr. A. G. Holmes and Mr. R. W. Beasley, chairman and clerk of the Cowes Harbour Commissioners, and Mr. S. C. Riggott, power station superintendent.

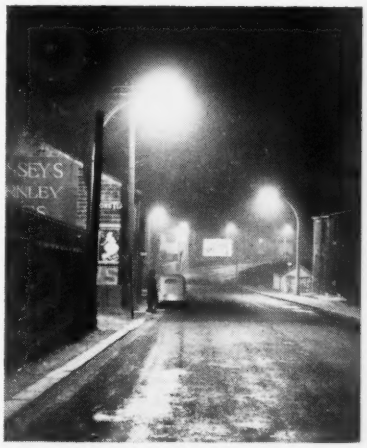
S.E. Scotland Board's Expenditure

The application of the South East Scotland Electricity Board for the total capital expenditure to be permitted to it in 1954–55 was reduced by £65,000 by the British Electricity Authority. A deputation from the Consultative Council met the B.E.A. on 30th June, and was informed that if the Board applied for the restoration of this £65,000 the application would be sanctioned. The Board has made application accordingly and will proceed to put in hand additional rural development schemes up to that value. The additional schemes to be undertaken will be the subject of recommendations by the Consultative Council at an early meeting, and it is contemplated that these will cover additional rural development work in the Board's Southern Sub-Area, and, in particular, work on the Kyloe-Fenwick scheme in Northern Northumberland.

Street Lighting

A new main road sodium street lighting scheme put into operation on the A.56 and A.676 roads at Ramsbottom, Lancs, is of interest both as a completed installation and from the point of view of the problems it entailed during erection. The installation was designed by the U.D.C. engineer and surveyor, Mr. E. M. Richardson, and all the equipment was supplied and erected by Crompton Parkinson, Ltd. The 140 W sodium lamps are housed in open type "Capella II" lanterns in which hermetically sealed "Perspex" prismatic refractor plates are used for light control. These are carried on Concrete Utilities' Avenue 3D and 3DN 25ft columns at an objective spacing of 130ft and with brackets varying from 2½ft to 8ft.

One section of A.676 is below the flood level of the River Irwell and the road is sometimes flooded to a depth of 3ft. The columns on this section, therefore, had to have extended plinths to bring the gear compartment above flood level. Moreover, the flooding of some of the pole holes on this route added further difficulties to the installation team's work, as did the necessity of erecting a number of columns among overhead wires. On part of the A.56 the footpaths were either non-existent or very narrow so that it was necessary to use longer than normal columns and to site them behind walls in ground that was at a lower level than the highway. Part of the road runs along a mountainside 672ft above sea level and loose ground, running sand and rock were encountered, while in the old village of Edenfield the lighting engineers had to contend with uncharted stone drains and culverts.



New lighting installation on the A.56 road through Ramsbottom, utilizing Crompton 140 W sodium lamps in "Capella II" lanterns

Geothermal Steam and Atomic Energy

During the recent Budget debate in the New Zealand Parliament the Prime Minister, Mr. Holland, announced that agreement had been reached with the United Kingdom Atomic Energy Authority for launching a joint enterprise for the production of heavy water and electric power from geothermal steam bores at Wairakei, in the North Island. Mr. Holland said that the designing of the dual-purpose plant would be undertaken in the United Kingdom. By her part in the venture New Zealand would be making a unique contribution not only to her own power resources but also to the development of atomic energy, which might well revolutionize the world's industrial processes. The first unit to be installed at Wairakei would have a capacity of 40,000 kW and additions would be made in the light of experience gained in its working. *Reuter* reports that in a Press interview Mr. Holland said that he was unable to give further details at this stage, for it was only in the last few days that Britain had expressed a wish to proceed with the project.

New Australian Station

On 23rd July the Port Augusta power station of the South Australian Electricity Trust was inaugurated by the Governor of South Australia, Air Vice-Marshal Sir Robert George. The new station, with an initial capacity of 10 MW, will supply power to Adelaide about 200 miles away. The fuel is lignite from the Leigh Creek deposits.

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

CONTRACTS OPEN

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses.

Argentina.—BUENOS AIRES.—7th September. Ministry of Industry. 744 km of h.v. line. (E.S.B. 17097/54. Ten/10099.)*

Australia.—PERTH.—2nd September. State Electricity Commission of Western Australia. Two 45,000/45,000/10,000 kVA and two 10,000 kVA transformers. (E.S.B. 18056/54. Ten/10053.)*

BRISBANE.—10th September. City Council. Signal generation and injection equipment for substations and receiving relays for installation in consumers' premises. (E.S.B. 18191/54. Ten/10054.)*

Belgian Congo.—LEOPOLDVILLE.—17th September. Government General. Material for an electrical distribution network at Luluabourg Aerodrome. (E.S.B. 18238/54. Ten/10089.)*

Belgium.—BRUSSELS.—25th August. Belgian Telegraph and Telephone Administration. Various telephone equipment. (E.S.B. 18199/54. Ten/10085.)*

Esher.—20th August. U.D.C. Electrically driven float-controlled 6in diameter centrifugal pump, for Cobham sewage disposal works. Surveyor, Council Offices.

Formosa.—TAIPEI.—24th August. Taiwan Power Co. Circuit breakers and lightning arrestors (E.S.B. 18407/54. Ten/10123).* 7th September. Electrical plant including a turbine, speed governor, pressure regulator, control equipment and switchboard. (E.S.B. 18571/54. Ten/10122).*

India.—MADRAS.—20th October. Government Electricity Department. Outdoor and indoor switchgear for extensions to substations. (E.S.B. 18182/54. Ten/10063.)*

Iraq.—BAGDAD.—1st September. Bagdad District Water Board. Three 75 kVA transformers. (E.S.B. 18197/54. Ten/10058.)*

Louth.—23rd August. R.D.C. Two electrically operated booster pumps, complete with equipment, at Horncastle Road Pumping Station. John H. Haiste & Partners, 4, Queen Square, Woodhouse Lane, Leeds, 2.

New Zealand.—AUCKLAND.—10th September. Auckland Electric Power Board. Street lighting fittings. (E.S.B. 18160/54. Ten/10055.)*

Pakistan.—KARACHI.—25th August. Ministry of Communications (Railway Division). Equipment for metre-gauge diesel electric locomotive workshops, Pahartali. (E.S.B. 18382/54. Ten/10080.)*

South Africa.—PRETORIA.—26th August. Union Tender and Supplies Board. P.v.c. wire for switchboards (E.S.B. 18458/54. Ten/10103.)*

Southport.—14th August. Borough Council. Automatically operated electrically driven, vertical spindle axial flow-type pumping unit, for Crowland Street storm water pumping station. Acting borough engineer, Town Hall.

ORDERS PLACED

London. — LAMBETH. — Borough Council. Recommended. Erection of 325 lamp columns under Stage 4 of the scheme for the conversion of street lighting from gas to electricity (£1,811).—Harland & Wolff.

County Council. Accepted. Three passenger lifts for block No. 7, Devons Estate, Poplar (£6,063).—Express Lift Co. Electrical installation work at Royal Hill primary school, Greenwich (£2,628).—Buchanan & Curwen.

Metropolitan Water Board. Accepted. Thirty-six through-type cold cathode lighting fittings, with lamps (£1,315).—Crompton Parkinson. Twelve batten-type ceiling mounting cold cathode lighting fittings with lamps (£462).—Courtney Pope (Electrical). Six electrically driven centrifugal pumping units and one vertical spindle electric motor, control gear, etc., for the Bexley pumping station (£41,167).—W. H. Allen, Sons & Co. Electrically-driven low lift pump, etc., at the Barn Elms Works (£3,998).—Hathorn Davey & Co. Switchgear, motor control gear, etc., for Turnford pumping station (£1,390).—Belmos Co.

LEWISHAM.—Housing (Building) Committee. Electrical work on the second stage of the Ladywell Park housing scheme (£1,455).—Brakefields.

Newcastle-on-Tyne. — Regional Hospital Board. Alterations to electrical installation at Preston Hospital (£1,437).—Veale Nixon.

City Council. Fluorescent (£1,255) and sodium lighting equipment (£1,110) for the Slatyford Lane transport depot.—A. E. Dees.

Newcastle-under-Lyme. Housing Committee. Electrical installations in houses to be erected on the Clayton Lane estate. — J. Bagguley & Son.

WORK IN PROSPECT

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Aldridge.—Secondary school (£187,000); County Education Office, Green Hall, Lichfield Road, Stafford.

Barrowford (Lancs).—Erection of new mills for Samuel Holden, Ltd.; John Laing & Son, Ltd., Carlisle.

Bath.—Development of Whiteway estate, providing for 383 flats, houses and maisonnettes, for T.C.; J. Owens, city engineer, Guildhall.

Birmingham.—Completion of Bush House, Broad Street and Cumberland Street corner, to be used as Corporation offices (£464,295); A. G. Sheppard Fidler, city architect, Civic Centre, 1.

Bishop Auckland.—Houses (106); J. Ford, U.D.C. surveyor.

Blackburn.—Houses (100), Shadsworth housing site; Charles S. Robinson, town clerk.

Bollington.—Houses (82), at Henshall Road site for U.D.C.; Vessey, Ltd., Marple.

Brentford.—Factory; W. K. Surtees & Co., Ltd., Swains Road, S.W.17.

Bristol.—Omnibus station, Whitson Street; Bristol Tramways & Carriage Co., Ltd., St. Augustines Place.

Cannock.—Great Wyrley and Cheslyn Hay sewerage scheme, including three pumping stations for R.D.C.; Sir Arnold Waters, engineer, 25, Temple Row, Birmingham, 2.

Corby.—Houses (140), on sites at Lodge Park estate, for U.D.C.; G. B. Blackall, clerk, Council Offices.

Crawley.—Houses (38), on sites at West Green, for Development Corporation; chief architect, Broadfield.

Crediton.—Houses (40), Butts Park estate; F. W. Beech and E. Curnow Cooke, architects, 15, Dix's Field, Exeter.

Daventry.—New school for Northants C.C.; county architect, Northampton.

Derbyshire.—Derbyshire crematorium on land between Chesterfield and Brimington, for C.C.; county architect, Derby.

Didcot.—Three-storey block of shops and flats, Newlands estate; Beecher & Stamford, architects, 14, Park End Street, Oxford.

Exmouth.—New building at Rolle College (£200,000), for Devon E.C.; H. V. de Courcy Hague, county architect, 97, Heavitree Road, Exeter.

Ketton.—Houses (42), at Ryhall, for R.D.C.; surveyor, Council Offices, Ironmonger Street, Stamford, Lincs.

Leicester.—Factory for Dallow, Lambert & Co., Ltd.; C. R. Price, 19/20, Hallgate, Doncaster.

London.—ACTON.—Maisonnettes (20), East Acton Lane; H. T. Oliver & Sons, Ltd., builders, 371, Clapham Road, S.W.9.

GREENWICH.—Dwellings (88), Coldbath Street housing site, for B.C.; D. J. Reason, town clerk.

WALTHAMSTOW.—Factory; Peter French, Ltd., Oakfield Works, Oakfield Road, E.17.

Manchester.—All Hallows R.C. secondary school, Peel Hall, Wythenshawe; Greenhalgh & Williams, architects, 15, Mawdsley Street, Bolton.

Marlow.—Houses (55), Westhorpe Road; U.D.C. surveyor.

Morley.—Houses (96), on the Westerton Hall estate, for T.C.; E. V. Finnigan, town clerk.

Newcastle - on - Tyne. — Nursery school (£34,000); Northern Counties School for the Deaf.

Houses (58), Kenton North estate (£98,636); G. Kenyon, city architect.

Northwood.—Dwellings (52), South Ruislip Road; U.D.C. surveyor.

Oldbury.—Bungalows (36), and community centre at Pound Road for T.C.; Shaw Bros., Park Lane, Cradley.

Poole.—Office block; Hamworthy Engineering Co., Ltd., New Quay Road, Hamworthy.

Redcar.—Houses (104), at Lakes estate for B.C.; Middlesbrough and District Building Trades Association.

Rhondda. — Houses (42), at Ystrad Rhondda, for U.D.C.; C. Gingell, housing architect, 13, Ystrad Road, Pentre.

Rochdale.—Dwellings (78), at Kirkholt for B.C.; Geo. Wimpey & Co., Ltd., London.

Stanley.—Departmental stores in Front Street; F. W. Woolworth & Co., Ltd., District Office, Martins Bank Buildings, Liverpool.

Stockton-on-Tees.—Houses (39), and 66 flats in blocks at Portrack; borough architect.

Sunderland.—Junior technical school (680 boys) and a senior school, Ryhope Road; H. C. Bishop, borough architect.

Tynemouth.—Houses (216), at Chirton (£274,000); William Leech (Builders), Ltd., Clayton Street, Newcastle-on-Tyne.

Welwyn Garden City.—Houses (254), Hatfield Hyde site, for Development Corporation; John Laing & Son, Ltd., builders, Bunns Lane, N.W.7.

West Bromwich.—Houses (42), and 30 flats at Cypress Road, Yew Tree estate, for T.C.; surveyor.

Winchester. — Dwellings (44), Wecke Manor estate; A. S. Wilson & Partners, surveyor, 8, Storey's Gate, S.W.1.

Wolverhampton. — Factory; Turner Manufacturing Co., Ltd., Wulfruna Works, Villiers Street.

Workshops, stores and offices; A. F. R. Godfrey & Co., Ltd., 46, Waterloo Street.

* Specifications may be inspected at the Export Services Branch, Board of Trade, Lacon House, Theobald's Road, London, W.C.1 (Chancery 4411; extension 769).

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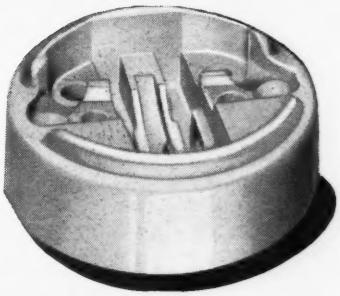

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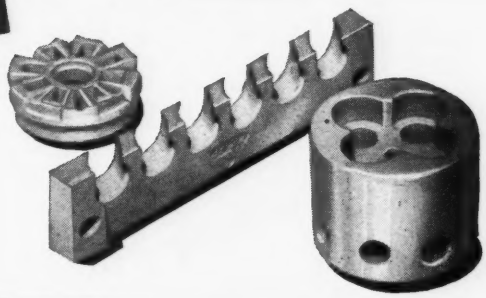

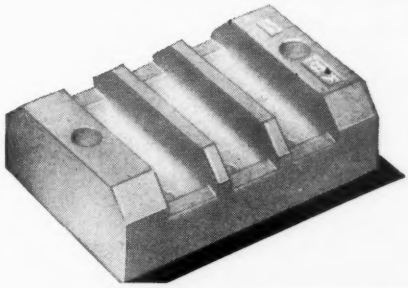

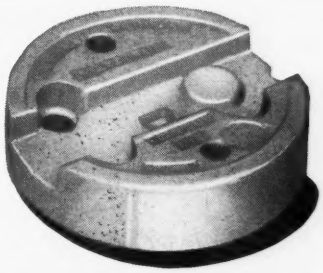

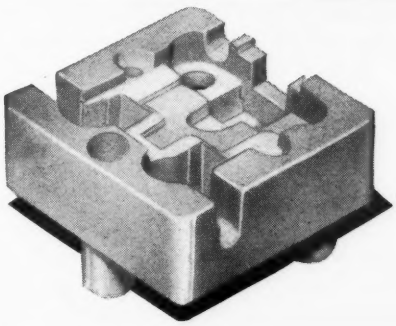

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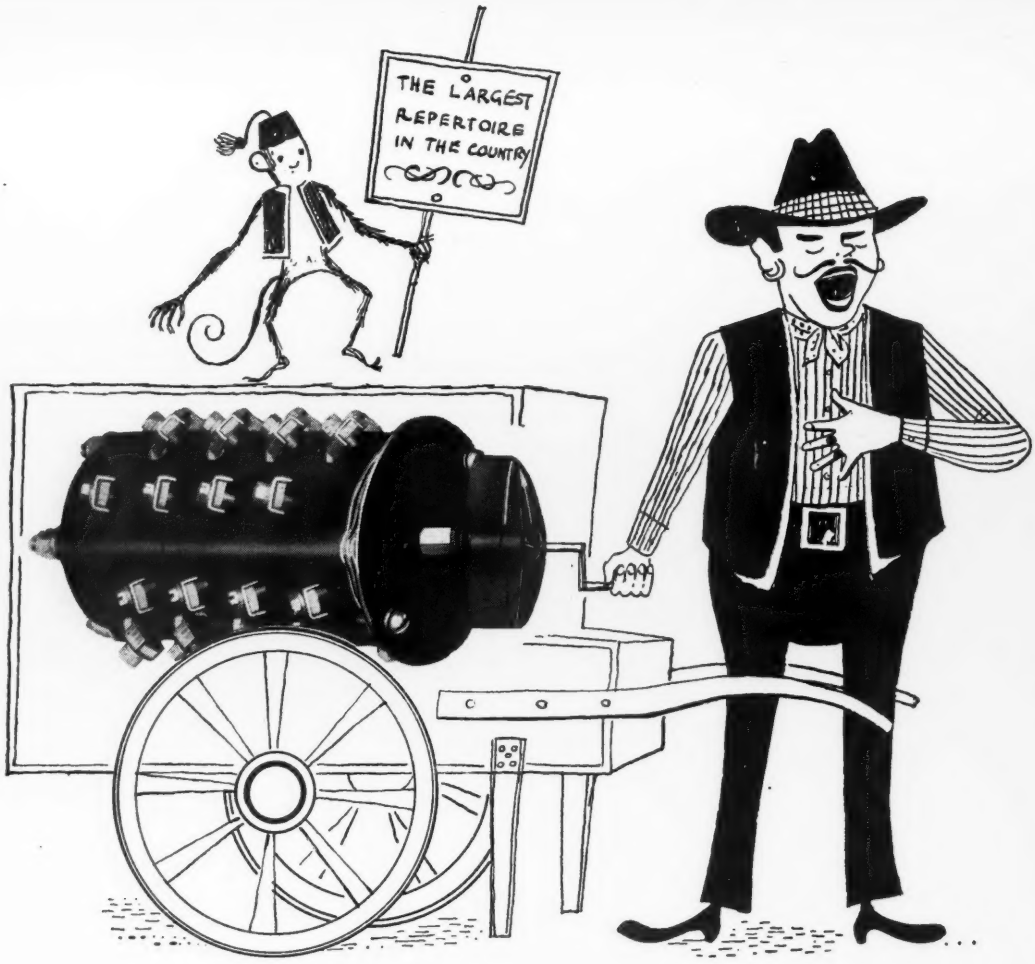

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Architects: Messrs. Devereux & Davies.

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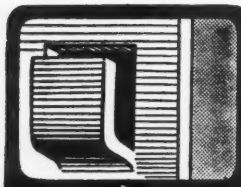
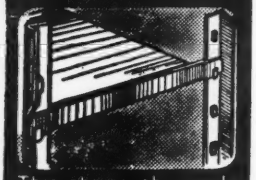


This shows the special pressed support, punched every 3" in the uprights.



This shows the angle runner in position, giving a definite and secure lock.

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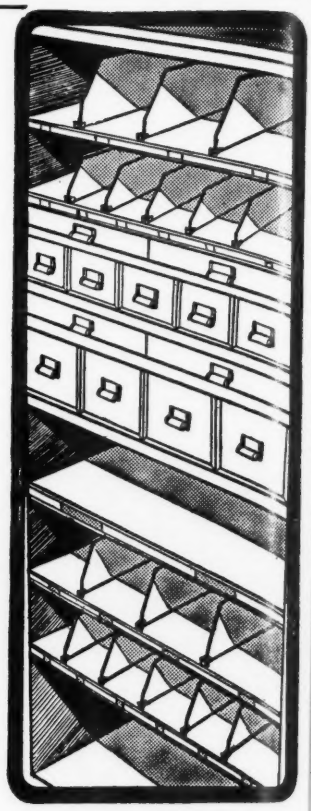

FAMOUS NUMBERS
TM 307/RP, TM 308/RP, TM 106/P, TM 308/5P
TUNION PRODUCTS are characteristically different

American and English Rubber Plugs

TM 307/RP

TM 307/RP. American type, 2-pin, rubber, flat, with deep head.

TM 308/RP

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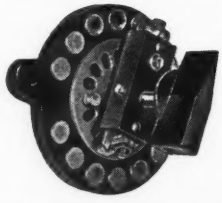

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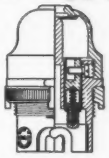

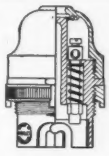

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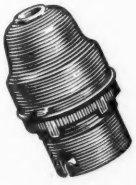
Terminals move during lamp insertion or removal.



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Heavyweight, with porcelain interior, solid plungers, non-rotating cap, and effective cord grip.

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Spring or solid plungers. With screwed bush and grommet, to grip 14/.0076 round twin T.R.S.

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Spring plungers. Easily wired body removes from base rear. 2" fixing centres. Available with "loop-in" third terminal.

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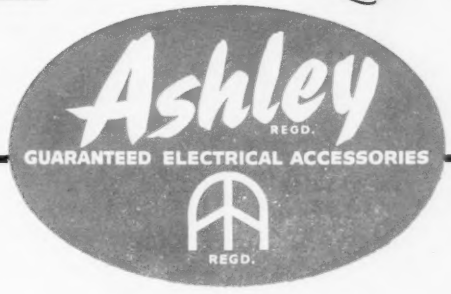

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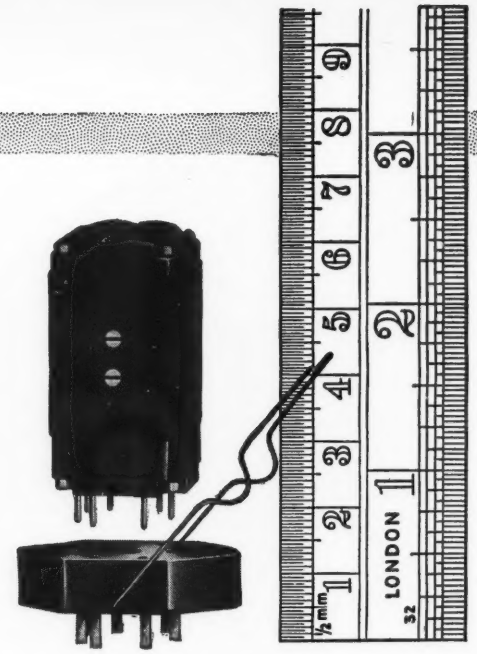
Weston Miniature Moving Coil Relay



The "Weston" Model S.115 Miniature Moving Coil Relay functions as a sensitive "on-off" current switch, and will operate on a power input of only 5 microwatts. Generally the relay is supplied with a centre stable moving contact, but a biased version which affords a single break, or a break followed by a make, is also available. The moving coil can be provided with two windings which offer considerable scope in circuitry. The relay has a seven pin base and is supplied with a separate chassis or panel mounting socket with retaining clip: mounting position is unimportant. Size $1\frac{1}{2}$" x $\frac{3}{4}$" x $2\frac{1}{4}$", weight $1\frac{3}{4}$ oz. only. List No. W.46 gives further particulars and is available on request, but these relays give best service when they are specially designed to suit the circuit in which they are to be used, and we shall be delighted to co-operate on receipt of the pertinent information.

Other WESTON relays

MODEL S54. A relay of extreme sensitivity (size 4-1/5" x 3-1/5"). The high torque developed by the moving system ensures positive contact pressure. Leaflet — List No. W.45 gives details.

MODEL S124. A sensitive relay (size 2-3/16" x 2-3/16") with magnetic hold-on contacts having a higher rating than the other models. Leaflet — List No. W.43 gives details.

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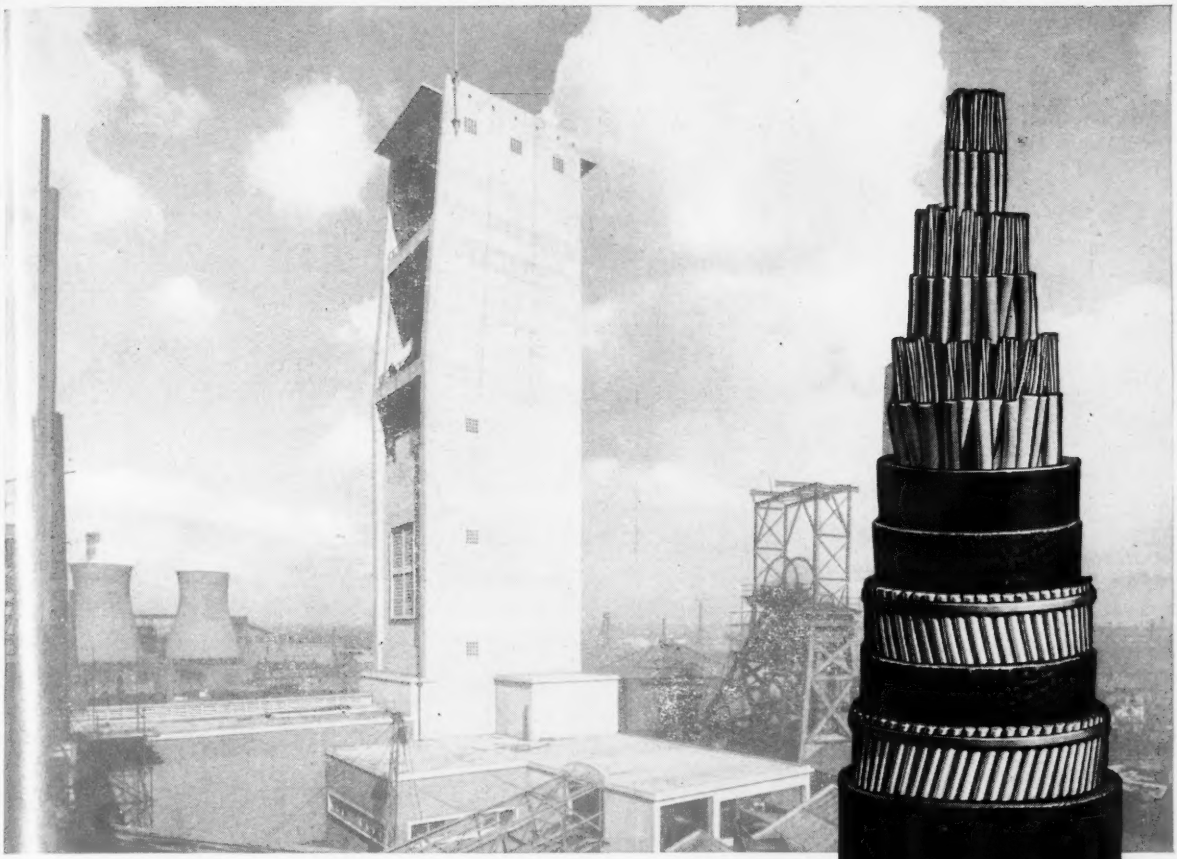

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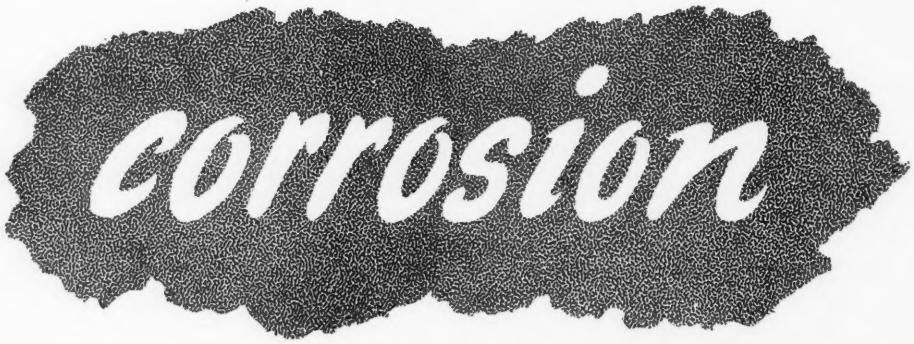
ALCHO-RE Fluxes eliminate



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RIGHT. Corrosion and deliquescence are visible on the specimen soldered with an active flux *only three days after soldering.*

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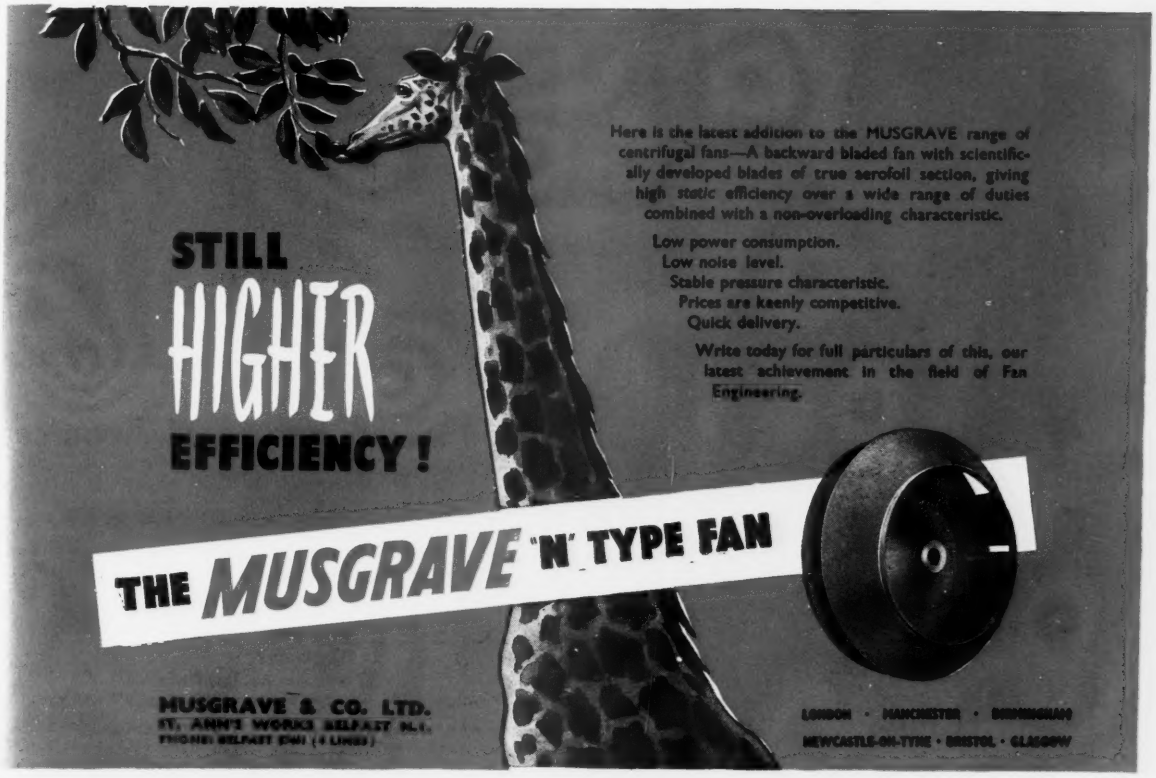
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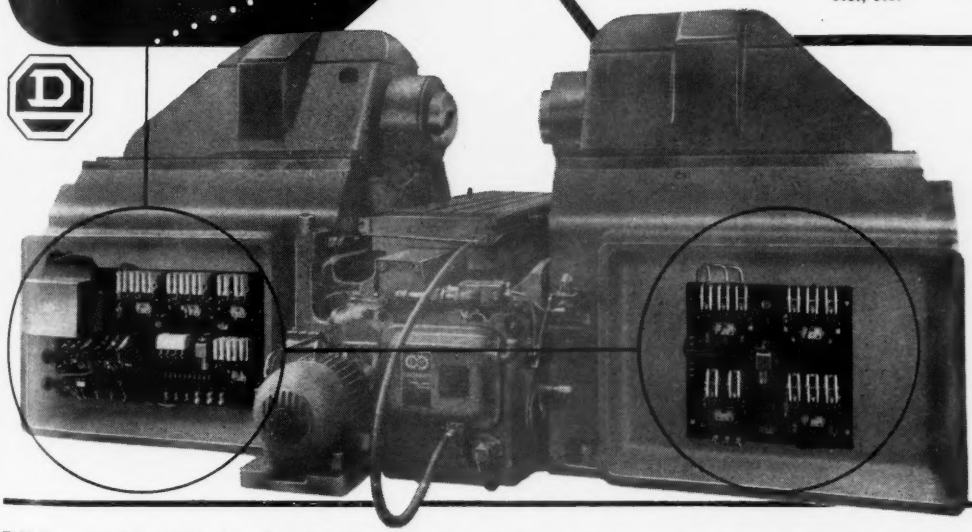

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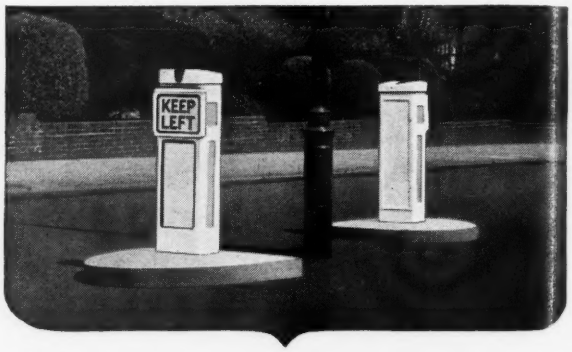

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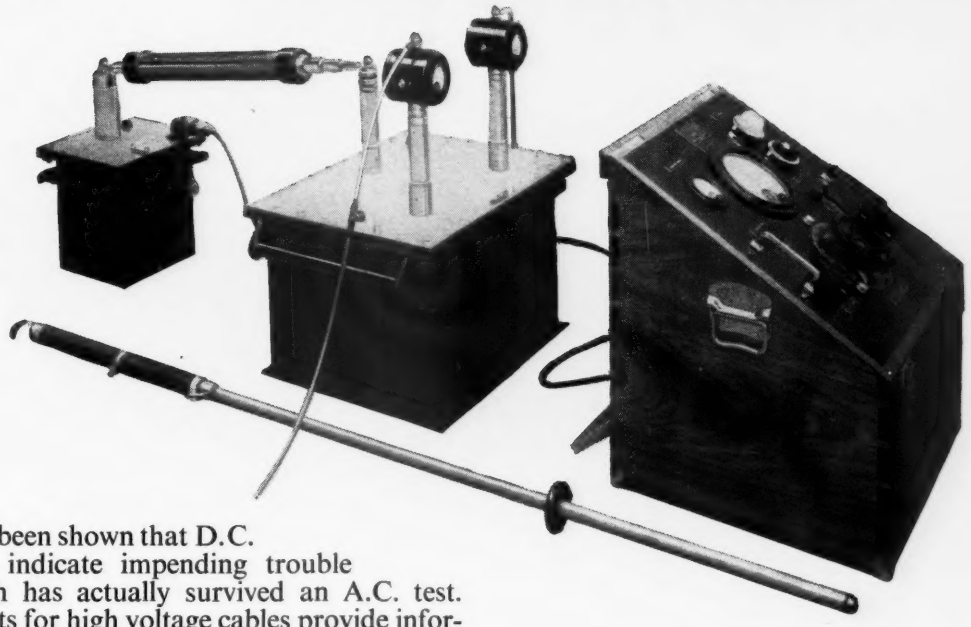

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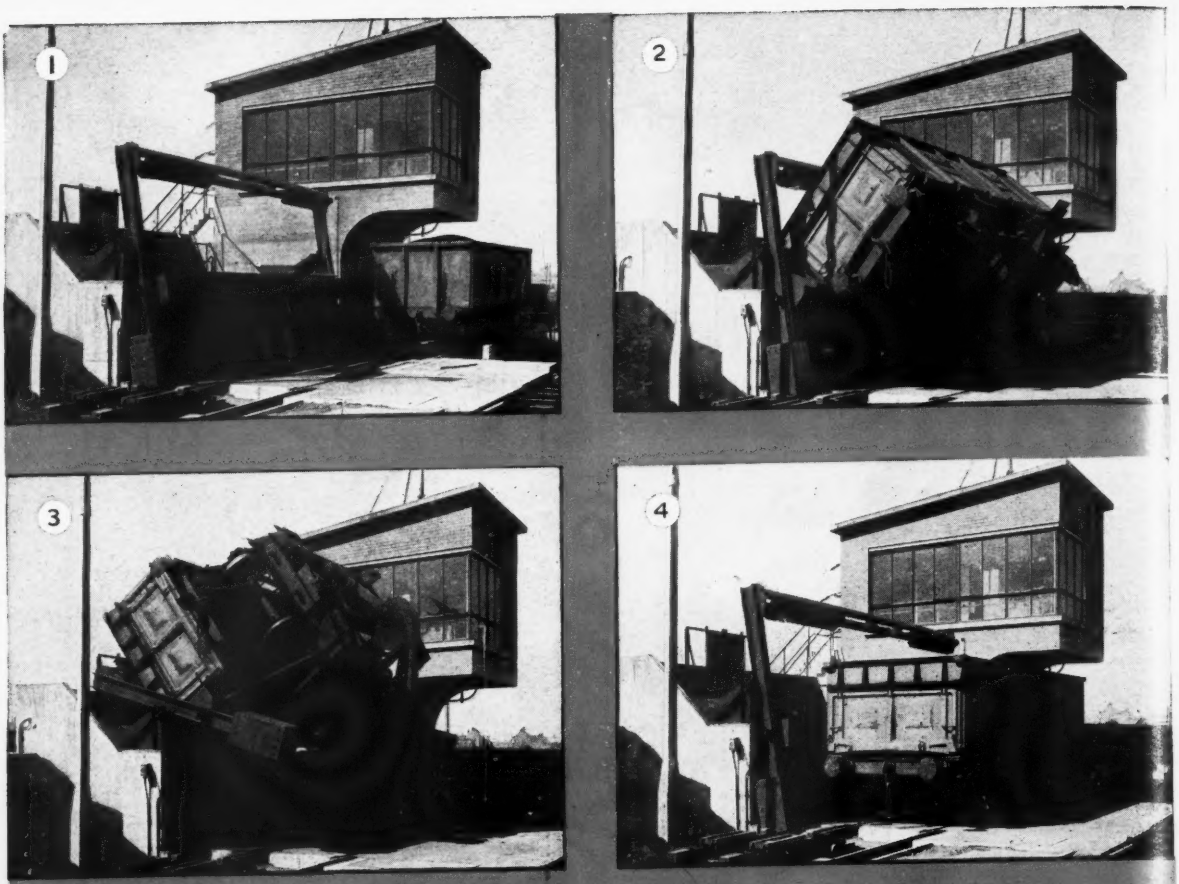

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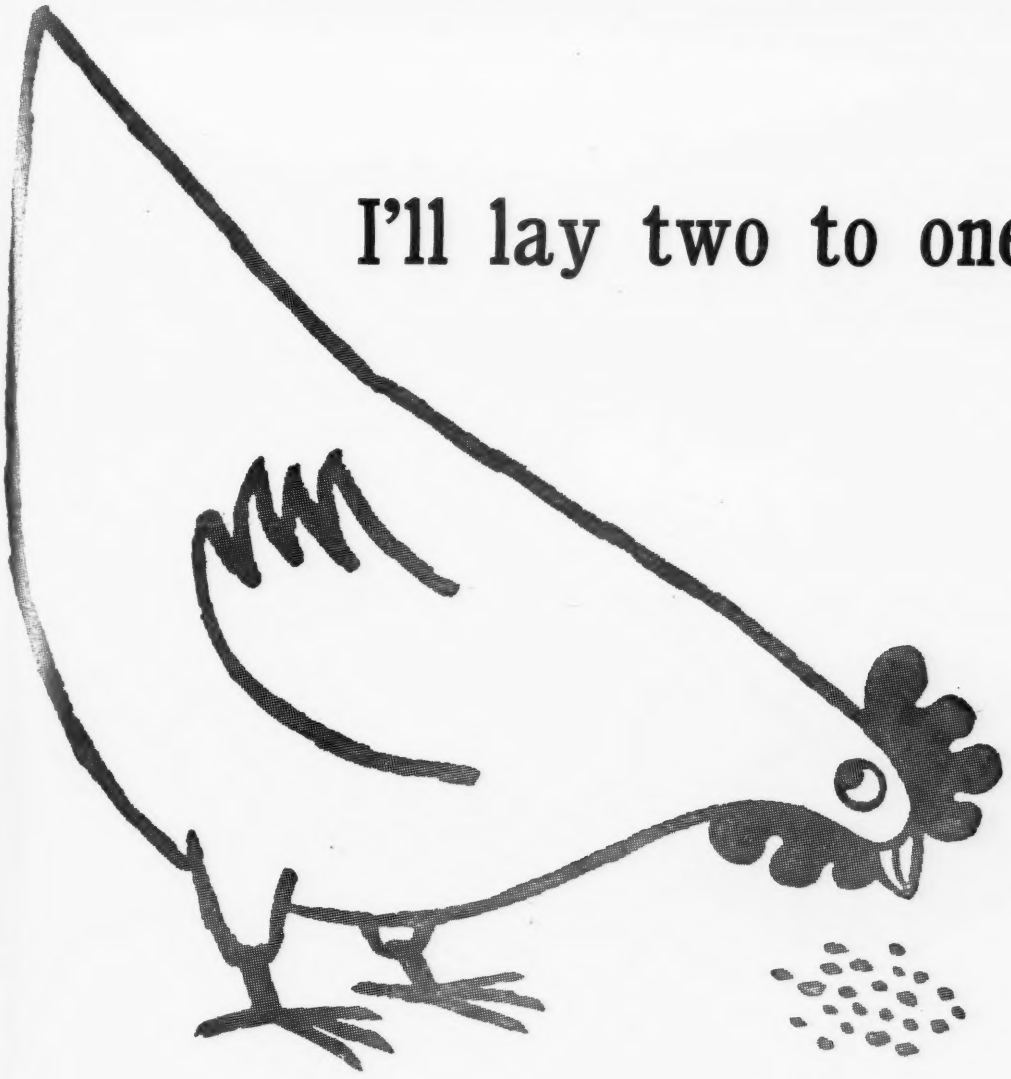
I'll lay two to one



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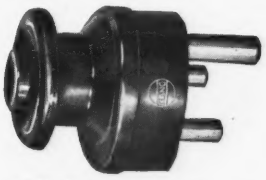

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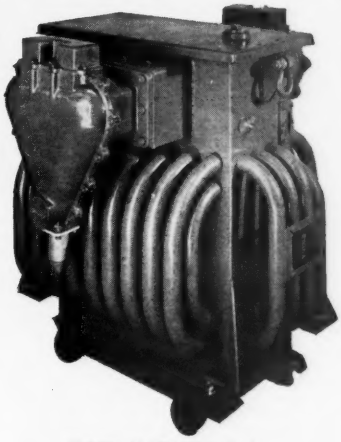

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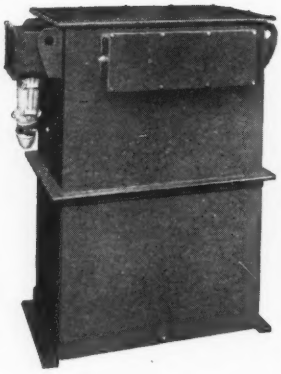

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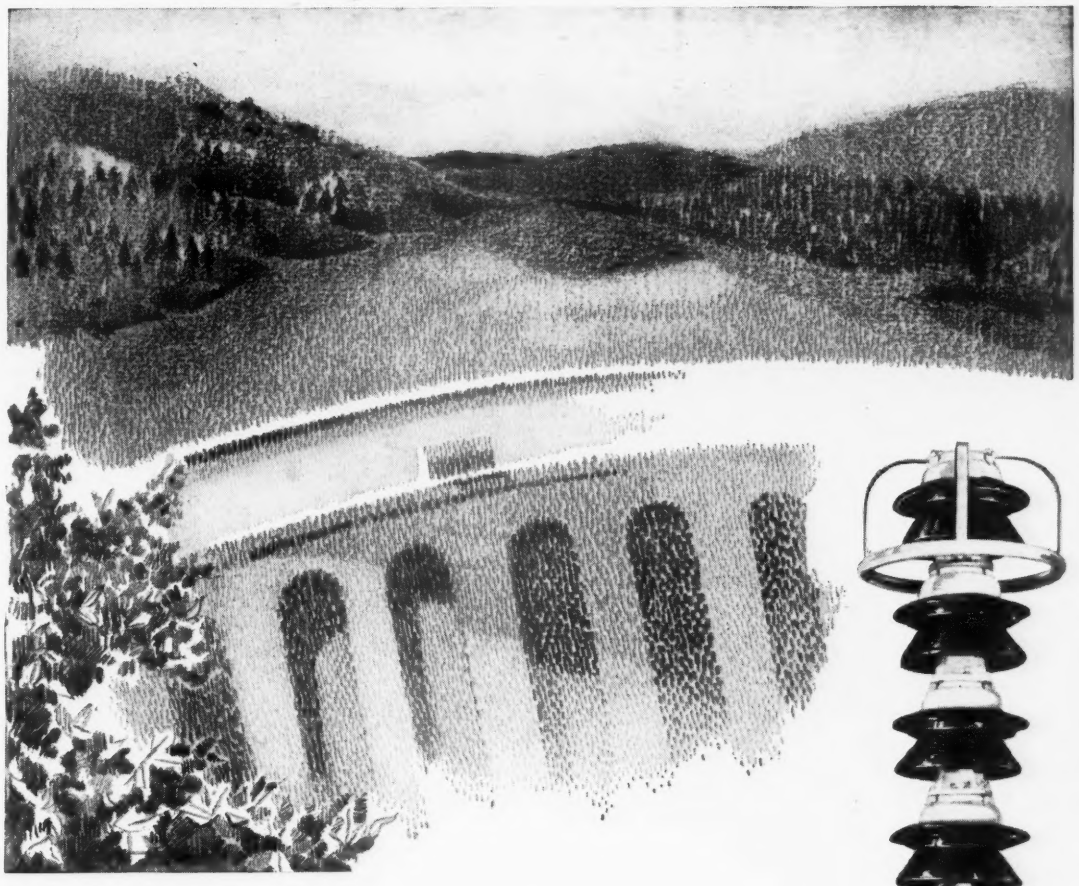

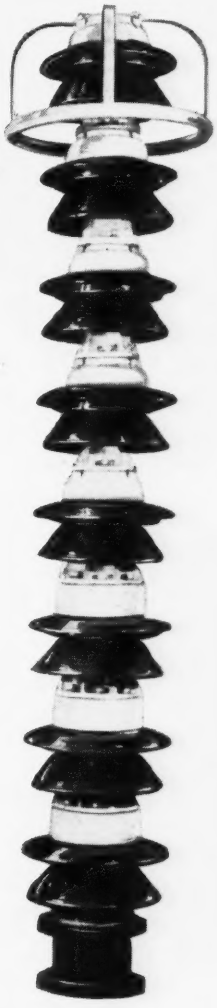

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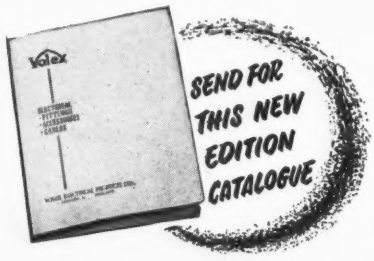

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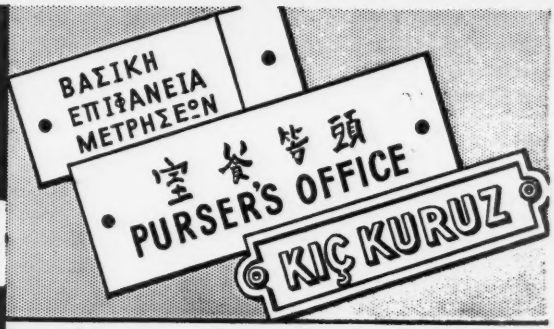

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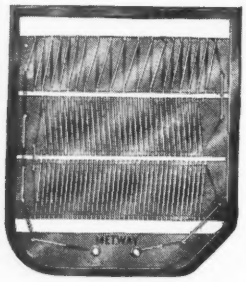

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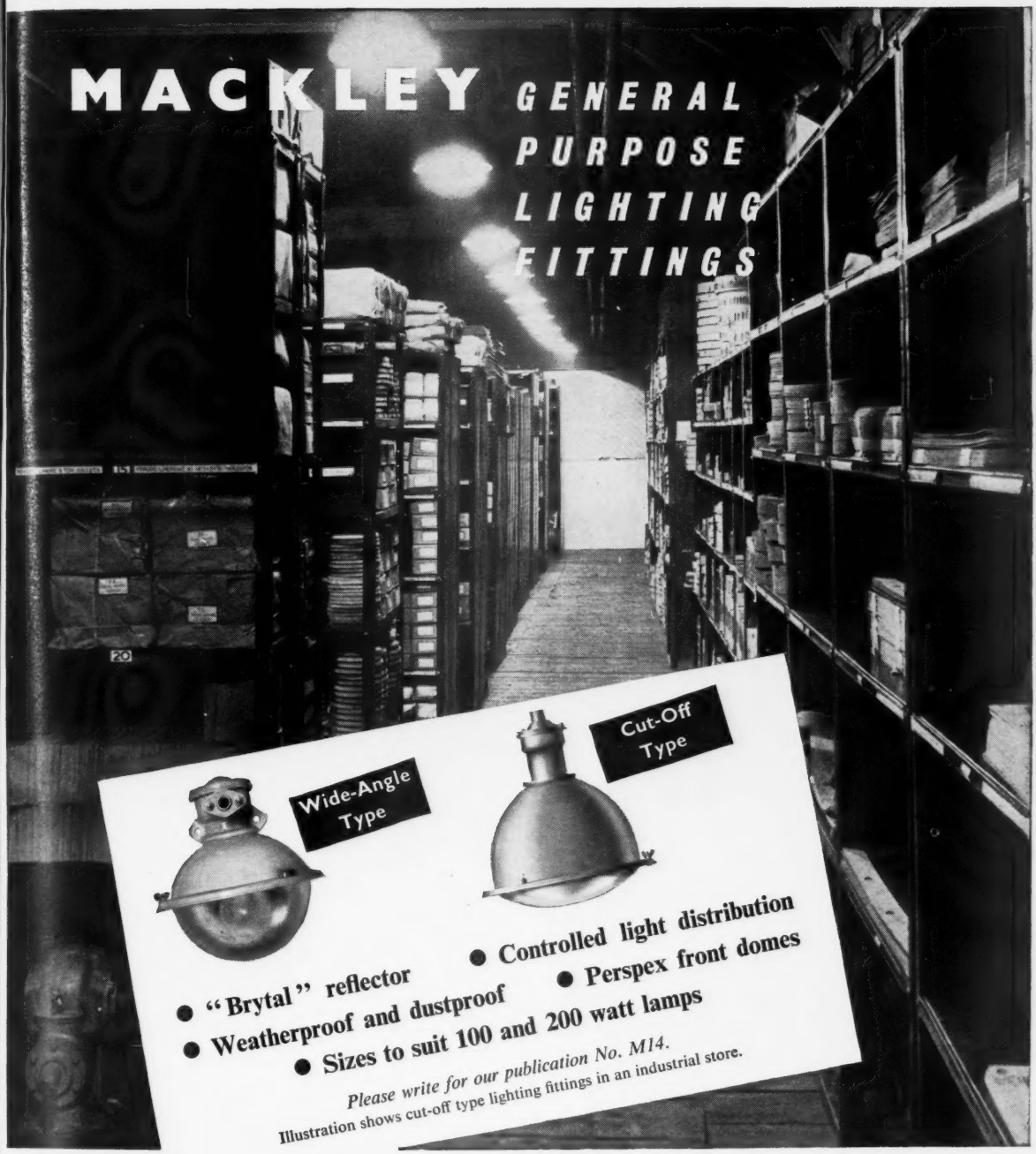
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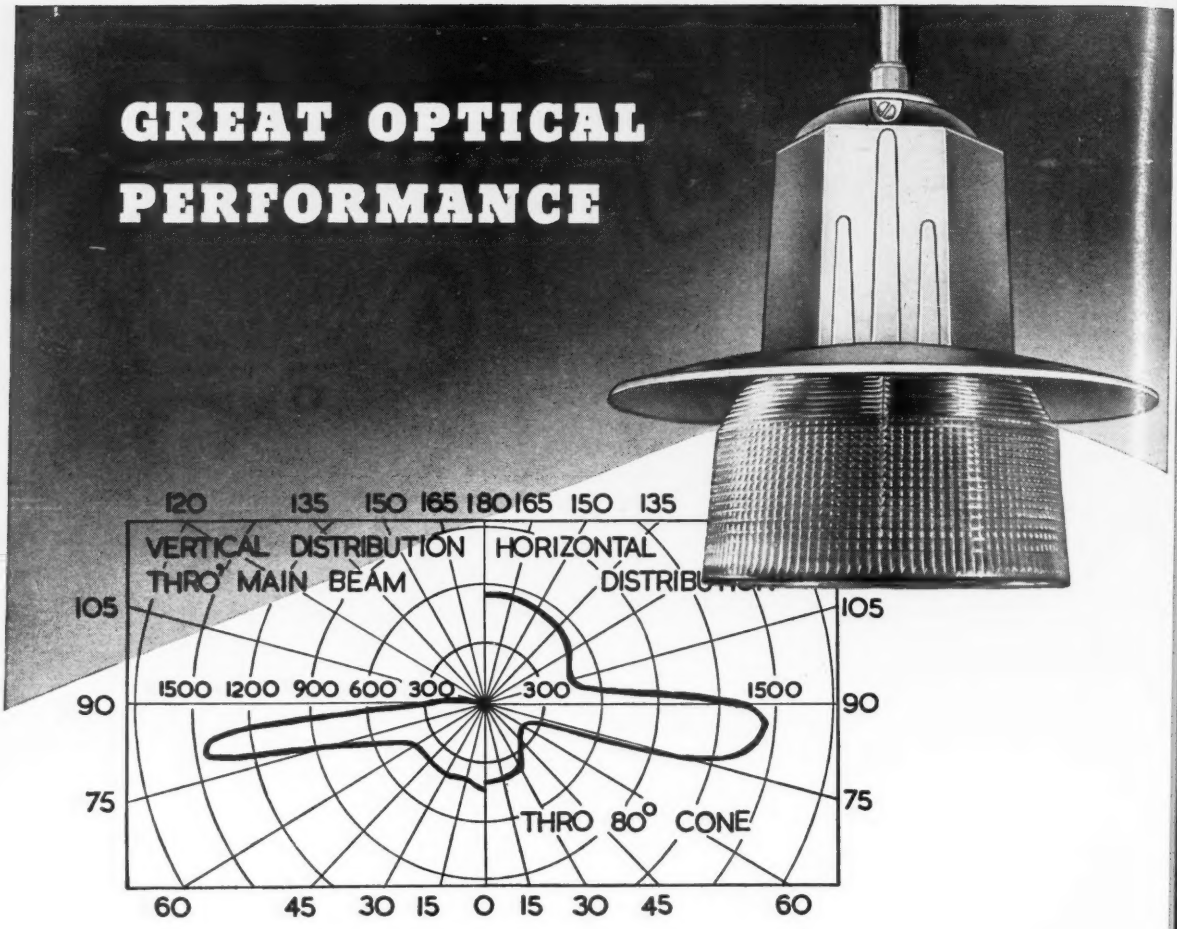

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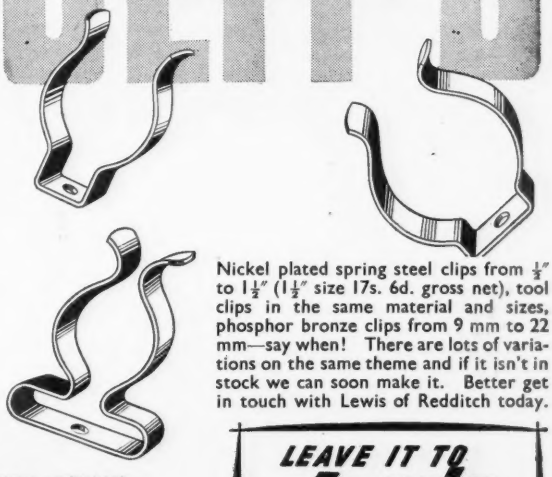

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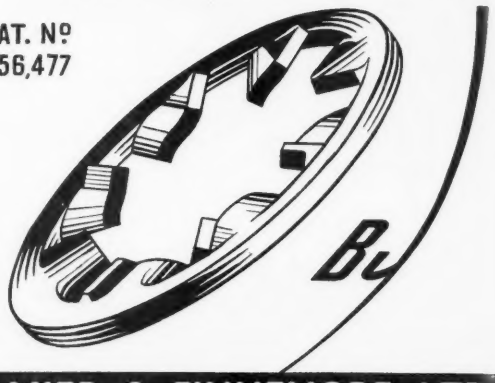

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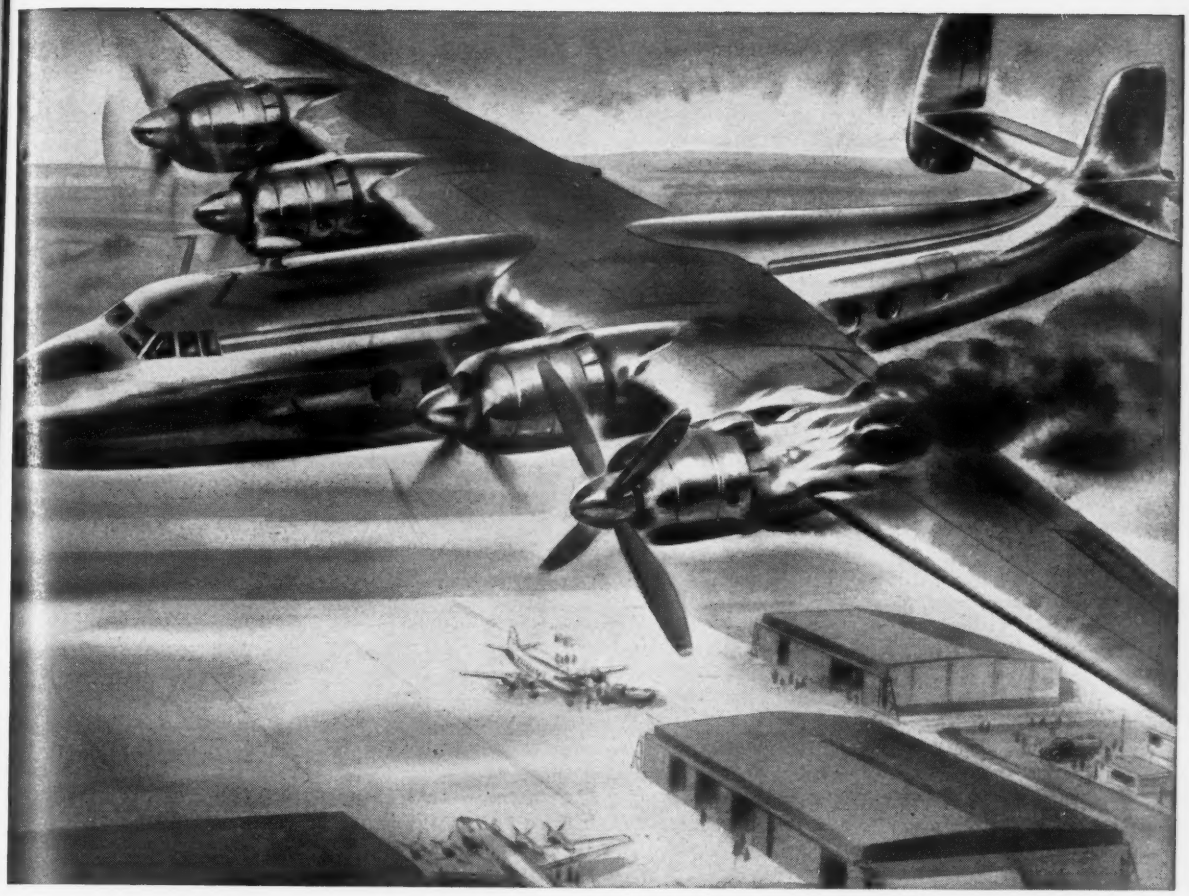

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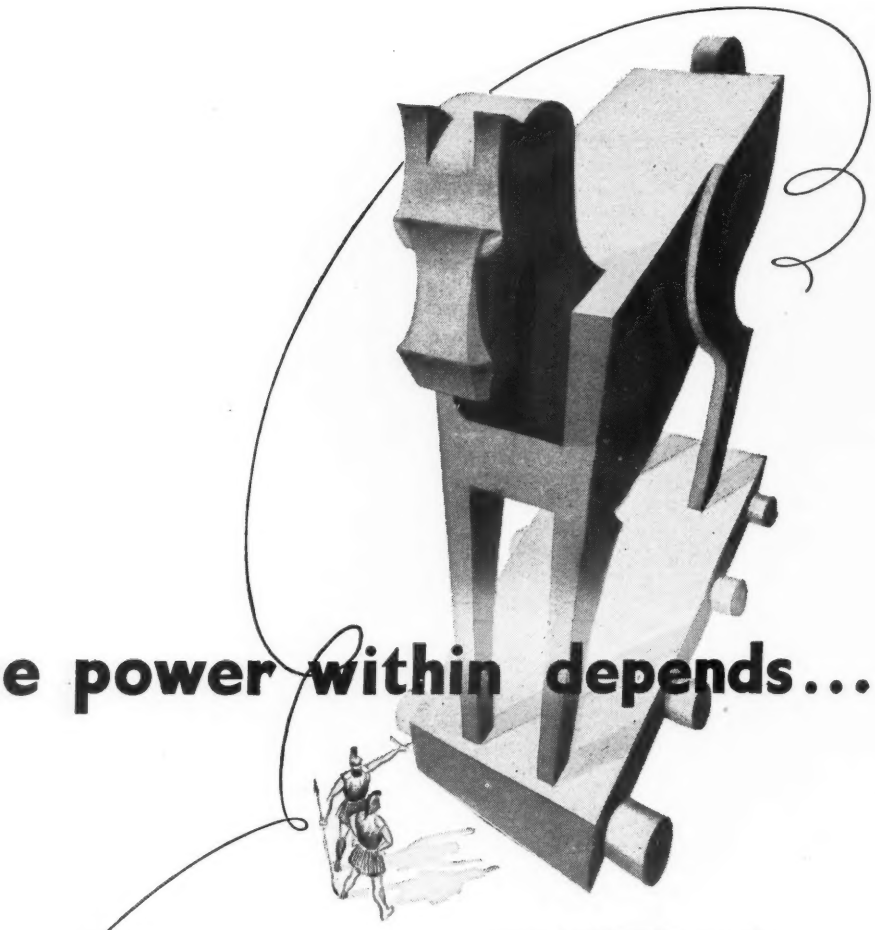

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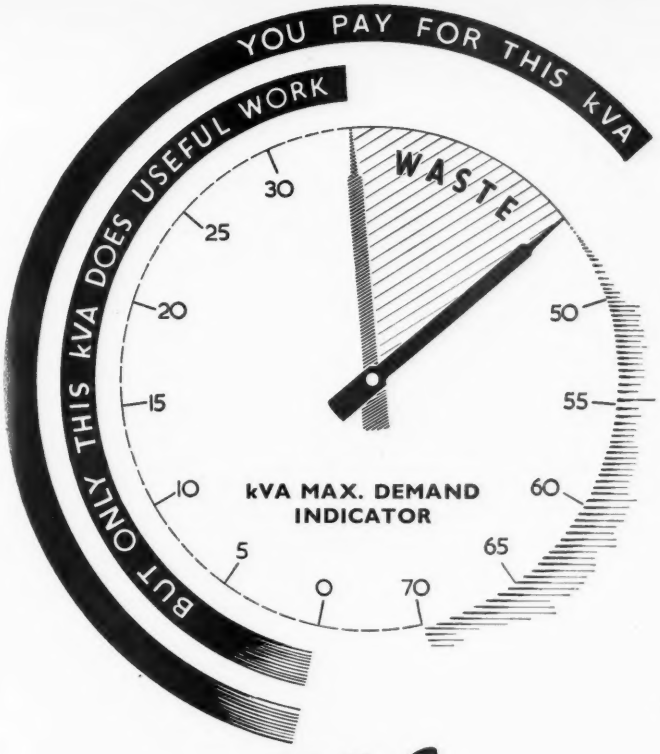

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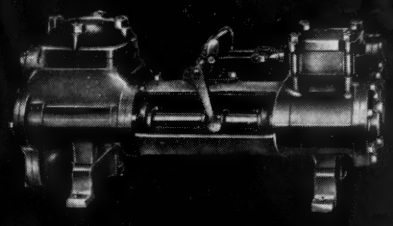

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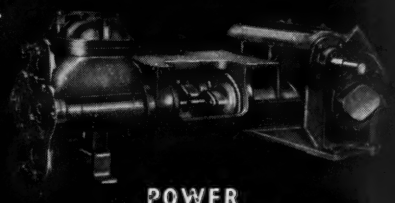

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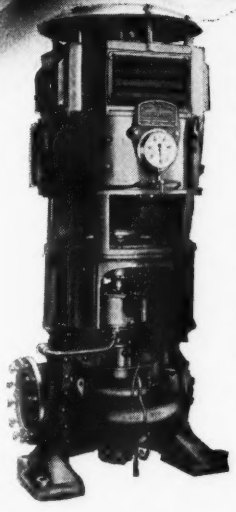

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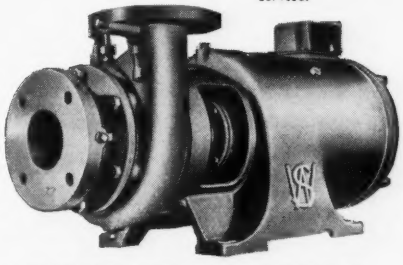

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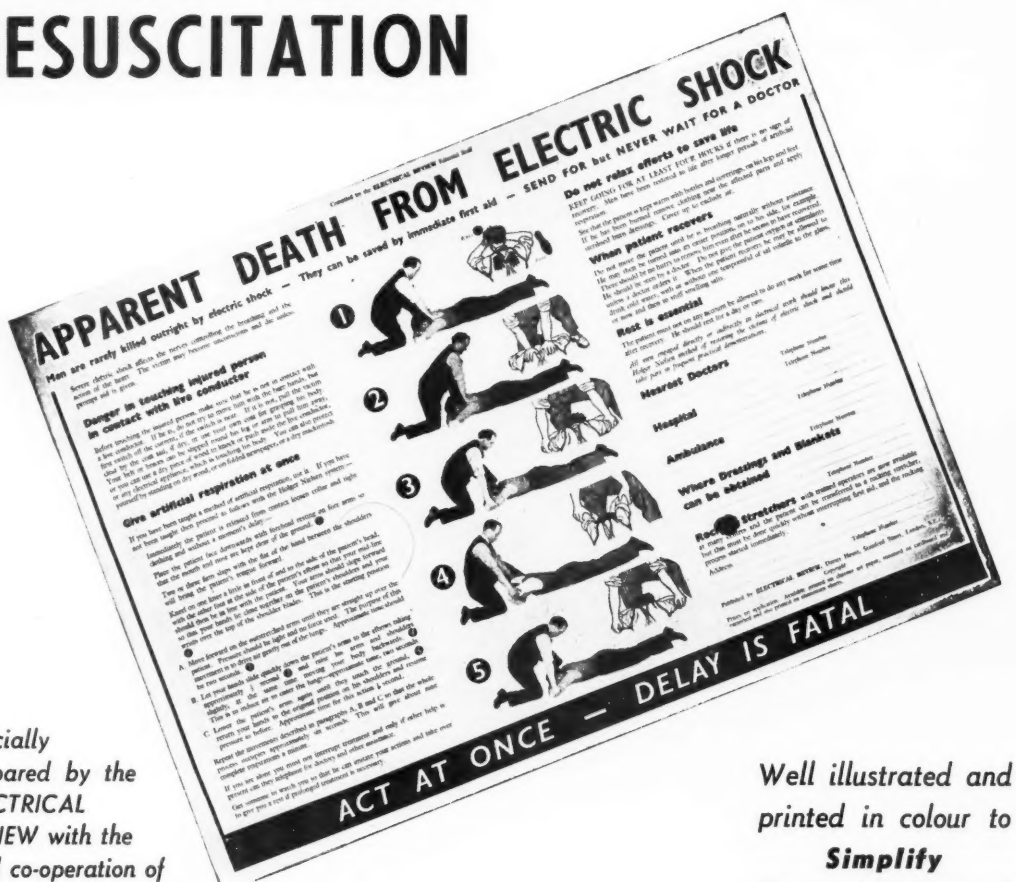
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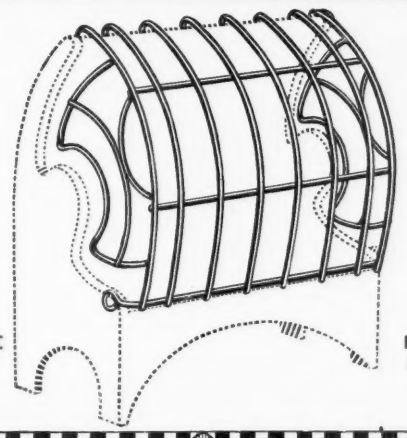
TO

BRITISH STANDARD SPECIFICATION



H·W·CARTER & JAMES LTD

BALSALL HEATH WIREWORKS, WENMAN STREET

BIRMINGHAM, 12

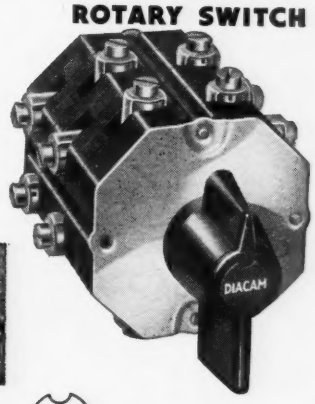
CAL. 1733 "WIRING" B'HAM

THE VERSATILE

DIACAM

ROTARY SWITCH

This 30-amp. rotary switch has solid silver contacts and a double-break on each pole, ensuring maximum efficiency and absolute safety under all conditions. Available in most sequences for either single or multi-pole switching.

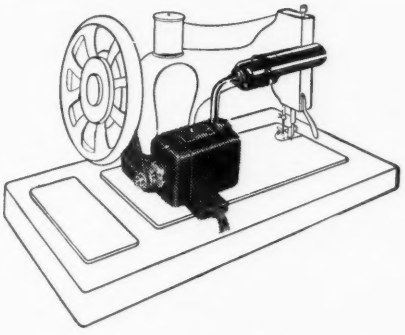


This shows the patent terminal clamp securing two conductors

The specially engraved identity discs, also panel mounting indicator plates, can be supplied to customers' requirements

CRAIG & DERRICOTT LTD.

ROYAL WORKS, SUTTON COLDFIELD. Tel.: Sutton Coldfield 2547



SEW-TRIC

SEWING MACHINE MOTORS

Ideal Motor to transform hand or treadle Sewing Machine to Electric. British made 1/15 H.P. Motor. Running cost negligible. Complete with needle light and radio interference eliminator. Type ML/DB (Foot control) £6. 10. 3. Type ML/DBK (Knee control) £5. 18. 3. Prices include Purchase Tax.

SEW-TRIC LIMITED

SEW-TRIC HOUSE, HONEYPOT LANE, STANMORE, MIDDLESEX

CORK *processed and agglomerated by modern methods for modern industrial use*

BTC

BRITISH TECHNICAL CORK PRODUCTS LIMITED

CAVERSHAM MILL, MILL RD., CAVERSHAM READING, BERKS.

Telephone: Reading 71577/8

Cogent

G.E.C.

POST-TOP SMALL WEMBLEY LANTERN

This lantern has been designed for side road lighting and uses a 60-200w Osram tungsten filament or an 80w or 125w Osram mercury MB/U lamp.

New and outstanding features include :—

- Optical control is obtained by an inner prismatic glass dome refractor. It is supported by a lip at the top engaging with stainless steel spring clips, leaving the prismatic surfaces entirely unobstructed; the refractor and lamp are enclosed by a clear or rimpled outer globe made in glass or "Perspex"
- The spun and die-cast light alloy body is supplied with a cradle and post top spigot cap.
- A die-cast hinged ring with easy release catch, supports the outer globe.
- Hinged vitreous enamelled over reflector.
- The focusing device is die-cast in Mazak and lamp positioning is indicated on an embossed scale.
- Two rubber gaskets ensure that the lantern is completely weatherproof and dustproof.
- The outer globe is secured by stainless steel quick release spring clips.

THE GENERAL ELECTRIC CO. LTD., MAGNET HOUSE, KINGSWAY, LONDON, W.C.2

CLASSIFIED ADVERTISEMENTS

ADVERTISEMENTS are accepted up to **First Post on Monday** of the week of issue, and should be addressed to Classified Advertisement Department, Dorset House, Stamford Street, London, S.E.1.

CLASSIFIED advertisements are PREPAID at 3/- per line (approx. 6 words) per insertion. Where an advertisement includes a Box Number this counts as two words and carries an additional charge of 1/-.

DISPLAYED:—£2 per inch, per insertion. Cheques and Postal Orders should be crossed and made payable to ELECTRICAL REVIEW PUBLICATIONS LTD.

SITUATIONS WANTED:—Three insertions under this heading can be obtained for the price of two if ordered and prepaid with the first insertion.

REPLIES to Box Numbers should be addressed to the Box Number in the advertisement, c/o ELECTRICAL REVIEW, Dorset House, Stamford Street, London, S.E.1, but if not to be delivered to any particular firm or individual they should be accompanied by instructions to this effect, addressed to the Manager of the ELECTRICAL REVIEW. Replies in such cases cannot be returned. The name of an advertiser using a Box Number will not be disclosed.

Original testimonials should not be sent with applications for employment

OFFICIAL NOTICES, TENDERS, ETC.

BOROUGH OF STAMFORD

Electrical Installation and Wiring in Pre-War Council Houses

TENDERS are invited for the installation, and wiring and putting into service of electric lighting and heating points in pre-war Council houses and bungalows, being in some houses for the complete installation and in others for additions to the existing installation.

Tenders may be for works in any or all of the following groups:—

Group A: 71 Houses, 16 Bungalows.
Group B: 126 Houses, 8 Bungalows.
Group C: 142 Houses.
Group D: 113 Houses.
Group E: 87 Houses.
Group F: 30 Houses.

General conditions, specification, bills of quantities, schedules of houses and installations in each group, and form of tender, may be obtained from the Borough Engineer and Surveyor, Town Hall, Stamford, on payment of a deposit of two guineas, which will be returned on receipt of a bona fide tender not subsequently withdrawn.

Tenders, in plain sealed envelopes endorsed "Council House Lighting," and without any mark or name indicating the sender, should be addressed to the undersigned to arrive not later than noon on the 4th September, 1954.

The Council does not bind itself to accept the lowest or any tender.

H. G. WHEWAY,
Town Clerk.

Town Hall,
Stamford, Lincs.
29th July, 1954. 4420

SEDGLEY URBAN DISTRICT COUNCIL

Street Lighting

Conversion to Electricity

TENDERS are invited from competent Electrical Contractors for Street Lighting to Class B standard as follows:—

Provide units to convert 20 existing gas columns to electricity with 80-watt Mercury Fluorescent Lighting, including all the necessary gear, and erect the columns on two roads within the district.

Plans may be seen and conditions of contract, specification and form of tender obtained from W. M. Jones, B.Sc.(Eng.), A.M.I.C.E., Engineer and Surveyor, The Limes, Dudley Road, Sedgley, to whom the completed tender should be returned not later than 12 noon, 23rd August, 1954.

The Council does not bind itself to accept the lowest or any tender.

K. R. F. NEWTON,
Clerk and Solicitor to the Council.

Council House,
Sedgley.
July, 1954. 4362

COUNTY BOROUGH OF DERBY

Tenders for Trunk Road Street Lighting: Ashbourne Road A.52 (Part)

TENDERS are invited for the provision, erection and putting into service of Street Lighting Columns, Brackets and Lanterns on the above trunk road.

Specifications, schedules and forms of tender may be obtained from Mr. M. L. Francis, Borough Engineer and Surveyor, Council House, Derby.

Plans and conditions of contract may be inspected at the same office during normal office hours.

Tenders endorsed "Trunk Road Street Lighting," in sealed envelopes and bearing no name or mark to indicate the sender, must reach the undersigned not later than 23rd August, 1954.

The Council do not bind themselves to accept the lowest or any tender.

G. H. EMLYN JONES,
Town Clerk.

Council House,
Derby.
July, 1954. 4402

SITUATIONS VACANT

The engagement of person answering these advertisements must be made through the Local office of the Ministry of Labour and National Service, etc., if the applicant is a man aged 18-64 or a woman aged 18-59 inclusive, unless he or she or the employer is excepted from the provisions of The Notification of Vacancies Order, 1952.

ZANZIBAR GOVERNMENT

ELECTRICAL TECHNICIANS as shown below required by ZANZIBAR GOVERNMENT for one tour of 2-3 years on contract. Salary scale (including present temporary allowance of £192/£257 a year) £782 rising to £1,097 a year. Commencing salary according to qualifications and experience. Gratuity of 13½% of total basic salary drawn during contract. Outfit allowance of up to £60. Free passages. Liberal leave on full salary.

(A) INSTALLATION INSPECTOR (M2C/30666/EF). Candidates must have served an apprenticeship and hold the O.N.C. in Electrical Engineering or equivalent, with not less than three years' experience in charge of construction and maintenance of domestic and small industrial installations. A thorough knowledge of I.E.E. regulations is essential.

(B) OVERHEAD LINESMAN (M2C/30667/EF). Candidates must have served an apprenticeship and hold the O.N.C. in Electrical Engineering or equivalent, with not less than five years' experience of construction and maintenance of L.T. and 11-kV overhead lines and services.

(C) ELECTRICIAN (M2C/30668/EF). Candidates must have served an apprenticeship and hold the O.N.C. in Electrical Engineering or equivalent, with not less than three years' experience in maintenance of domestic and industrial wiring installations, motors, household appliances and various forms of lighting equipment. Knowledge of refrigeration an advantage.

Write to the Crown Agents, 4, Millbank, London, S.W.1. State age, name in block letters, full qualifications and experience, and quote the reference number stated against the post applied for. 4410

BIRMINGHAM CITY TRANSPORT

(a) Assistant Plant Engineer (Salary £620-£670 p.a.)
(b) Assistant Test Engineer (Salary £580-£625 p.a.)

APPLICATIONS are invited for the above positions in the Birmingham Corporation's Transport Department.

Qualifications for appointment: (a) Associate Membership of the Institution of Electrical Engineers, or equivalent; (b) National Certificate in Mechanical Engineering.

Application forms may be obtained from the undersigned. Canvassing disqualifies.

W. H. SMITH,
General Manager.

Council House,
Congreve Street,
Birmingham, 3. 4432

CLASSIFIED ADVERTISEMENTS
ARE PREPAID

BRITISH ELECTRICITY AUTHORITY

Eastern Division

APPLICATIONS are invited for the following posts:—

FIRST ASSISTANT STATION CHEMIST, LITTLE BARFORD GENERATING STATION. Salary Class G, Grade 9, £641-£667 p.a.

Applicants should preferably be qualified B.Sc. or hold an equivalent qualification in chemistry, but other suitably experienced applicants will be considered if they are following a course of study leading to such a qualification.

Sound knowledge and experience of the work of a generating station laboratory are essential, and some knowledge of the more specialised chemical aspects is desirable.

JUNIOR ENGINEER, LITTLE BARFORD GENERATING STATION. Salary Class G, Grade 16, £402, to Grade 14, £491 per annum. Commencing salary depending on qualifications and experience.

The duties of the successful applicant will include assisting in the control room on shift and other operation and investigation duties. Preference will be given to applicants who have reached the standard of the Ordinary National Certificate in Electrical Engineering or its equivalent.

JUNIOR ENGINEER, WATFORD GENERATING STATION. Salary Class E, Grade 15, £390, to Grade 14, £445 per annum, plus London weighting. Commencing salary depending on qualifications and experience.

The duties involve assisting in the technical operation of boiler, turbine and electrical plant and form a suitable background for future promotion.

Previous experience with similar plant and technical training to Ordinary National Certificate standard or its equivalent will be advantageous.

Applications stating age, details of qualifications and experience should be sent to the Controller, British Electricity Authority, Eastern Division, Northmet House, Southgate, London, N.14, to arrive not later than 14th August, 1954.

W. N. C. CLINCH,
Controller. 4433

SOUTH EAST METROPOLITAN REGIONAL HOSPITAL BOARD

APPLICATIONS are invited for the post of SENIOR ASSISTANT ENGINEER at the Board's headquarters. Salary £875 × £30 to £1,025, plus London weighting of £40 a year. Candidates must be Corporate Members of the Institution of Civil or Mechanical or Electrical Engineers, with experience in the preparation of mechanical and electrical engineering schemes, preferably but not essentially in hospitals, and in fuel efficiency. Superannuable.

Applications, stating age, present salary, etc., with two referees, should reach the Secretary, 11, Portland Place, London, W.1, by 21st August, 1954. 4431

BRITISH ELECTRICITY AUTHORITY

South Western Division

GENERAL ASSISTANT ENGINEER (Protection) required in the Technical Dept., Plymouth Region.

Superannuation scheme. Salary N.J.B. Class AX/CX, Grade 8, £501-£675.

Applicants should possess qualifications leading to A.M.I.E.E. and have served with one of the leading electrical manufacturers. They should have an interest in protective gear design, generator and switchgear testing.

Applications on form A.E.6/ACT, obtainable from Divisional Secretary, 26, Oakfield Road, Bristol, 8, should be completed and returned by 16th August, 1954. 4430

BRITISH ELECTRICITY AUTHORITY

East Midlands Division

APPLICATIONS are invited for the following positions within the Division:—

SHIFT CONTROL ENGINEER, WARWICK POWER STATION (Vacancy No. 107/54/ER). Applicants should have had some experience in power station control and have O.N.C. in Electricity.

Salary for this appointment will be within Class E, Grade 10 (£555-£569 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications, 5th August, 1954.

JUNIOR ENGINEERS, STAYTHORPE POWER STATION (Vacancy No. 108/54/ER). Junior Engineers are required at Staythorpe Power Station, where suitable young engineers will be given opportunity to obtain operating and maintenance experience in the various sections of this large generating station operating at 900°/900 lb. sq. in. steam conditions.

Salary for this appointment will be within Class J, between Grades 17 and 14 (£424-£545 per annum), of the National Joint Board Agreement, according to qualifications and experience.

Preference will be given to candidates who hold the Higher National Certificate, or who are at present pursuing a course of study with the object of obtaining this or a similar qualification.

Closing date for receipt of applications, 5th August, 1954.

These appointments will be pensionable within the terms and provisions of the British Electricity Authority and Area Boards Superannuation Scheme.

Applications should be submitted on the official form AE6/ACT, which may be obtained from the Divisional Establishments Officer, British Electricity Authority, P.O. Box 25, Barker Gate, Nottingham, and should be returned to the undersigned by the date stated. Please quote vacancy number.

L. F. JEFFREY,
Divisional Controller.

The following amends the advertisement previously issued for Vacancies No. 1/54, 2/54 and 3/54:—

TWO SENIOR DRAUGHTSMEN (CIVIL), CONSTRUCTION DEPARTMENT (Vacancy No. 112/54/ER). Candidates should have experience in the preparation of detail drawings and in the design of one or more of the following subjects:—

Reinforced concrete structures.
Piled and slab foundations for heavy components.
Cable subways, bridges and culverts.

The salary will be in accordance with Grade 4 (£671-£780 per annum) or Grade 5 (£567-£671 per annum) of Schedule D of the National Joint Board Agreement.

Closing date for receipt of applications, 12th August, 1954.

TWO SENIOR DRAUGHTSMEN (MECHANICAL), CONSTRUCTION DEPARTMENT (Vacancy No. 113/54/ER). Candidates should have experience on one or more of the following:—

(i) Design and layout of power station equipment, including turbo-alternators, boiler plant, coal and ash plant and general station auxiliaries.
(ii) H.P. and L.P. steam and feed pipework; condensing plant and feed heating systems.
(iii) Conveyor plant, coal handling systems and material handling of station auxiliary equipment.

The salary will be in accordance with the National Joint Board Agreement, Grade 4 (£671-£780 per annum) or Grade 5 (£567-£671 per annum) of Schedule D, according to experience.

Closing date for receipt of applications, 12th August, 1954.

FOUR SENIOR DRAUGHTSMEN (ELECTRICAL), CONSTRUCTION DEPARTMENT (Vacancy No. 114/54/ER). Candidates should have experience in the preparation of layouts and diagrams for the installation of E.H.T. and L.T. switchgear, transformers, E.H.T. and L.T. cables; knowledge of protective gear systems would be an advantage.

The salary will be in accordance with the National Joint Board Agreement, Grade 4 (£671-£780 per annum) or Grade 5 (£567-£671 per annum) of Schedule D, according to experience.

Closing date for receipt of applications, 12th August, 1954.

The above appointments will be pensionable within the terms and provisions of the British Electricity Authority and Area Boards Superannuation Scheme.

Applications should be submitted on the official form AE6/ACT, which may be obtained from the Divisional Establishments Officer, British Electricity Authority, P.O. Box 25, Barker Gate, Nottingham, and should be returned to the undersigned by the date stated. Please quote vacancy number.

L. F. JEFFREY,
Divisional Controller.

23rd July, 1954. 4367

BRITISH ELECTRICITY AUTHORITY

London Division

APPLICATIONS are invited for the following superannuable posts. Conditions of service in accordance with N.J.B. Agreement, Schedule A. Salary includes London allowance.

JUNIOR ENGINEERS (CONTROL), BRUNSWICK WHARF GENERATING STATION (Vacancy No. 54/629). Duties include assisting in main control room, with opportunity for gaining general knowledge of power station. Shift duties. Qualifications entitling to Graduate Membership of I.E.E. or I.MechE. an advantage. Salary Class K, Grade 15/3 = £572 5s. p.a.

STATION CHEMIST, HACKNEY GENERATING STATION (Vacancy No. 54/630). This appointment also carries responsibility for chemical services to Islington, St. Pancras and Walthamstow Generating Stations. Applicants should possess B.Sc. or equivalent qualification in chemistry, and have a thorough knowledge of power station practice relating to the examination of fuels, oils and waters. Candidates should preferably have held a similar post in a modern station and have experience in control of staff. Salary Class H, Grade 7 = £810 12s. p.a.

FIRST ASSISTANT STATION CHEMIST, TAYLORS LANE GENERATING STATION (Vacancy No. 54/631). Candidates must have experience in a laboratory of a modern high-pressure station and be fully conversant with the testing and analysis of fuels, oils and water. Salary Class F, Grade 9 = £637 7s. p.a.

JUNIOR ENGINEERS (Vacancy No. 54/560). Junior Engineers required at various power stations in the London Area. Excellent opportunities for training and promotion to higher grades. Salary and conditions of service in accordance with N.J.B. Agreement.

Applications, quoting vacancy number, may be made on form obtainable from Divisional Secretary, British Electricity Authority, London Division, Generation House, Great Portland Street, London, W.1, and be received within 14 days of this advertisement. 4409

BRITISH ELECTRICITY AUTHORITY

North West, Merseyside and North Wales Division

APPLICATIONS are invited for the appointment of GENERAL ASSISTANT ENGINEER (Civil Engineering) in the Liverpool Office of the Construction Department, Springwood House, Liverpool. Salary £501/£639 per annum, Class AX, Grade 8, Schedule C, N.J.B. Superannuable and subject to medical examination.

Applicants should preferably have the Higher National Certificate and preferably be student or graduate members of an appropriate institution. Some experience in the design and construction of power stations or in the works of a manufacturer of power station equipment is desirabe. The successful applicant will be required to assist in the design and construction of power stations, including the preparation of specifications, checking tenders, handling contracts, and general supervision of construction.

Application forms may be obtained from the Divisional Controller, Beaconsfield Road, Woolton, Liverpool. Closing date 18th August, 1954. 4406

NORTH WESTERN ELECTRICITY BOARD

APPOINTMENT of JUNIOR ENGINEER, SUB-AREA TECHNICAL ENGINEER'S DEPT., MANCHESTER. Applicants should have received a technical education to H.N.C. level, and have served an engineering apprenticeship or received equivalent training. Duties include assisting in the preparation of schemes and estimates for extension of a large city network and associated protective gear and metering problems. Drawing office experience will be an additional qualification.

Salary scale £402/£544 p.a., Grades N.22/8, N.J.B. conditions.

Applications to Sub-Area Secretary, No. 1 Sub-Area, North Western Electricity Board, Town Hall, Manchester, P.O. Box 493, by 14th August, 1954.

Appointment of SENIOR SALES REPRESENTATIVES, WIGAN AND BOLTON DISTRICTS. Duties include advising consumers on their premises on all matters normally concerned with sales development, i.e., tariff queries and apparatus sales for domestic and small commercial and industrial applications.

Experience in the application of electricity to agriculture and horticulture would be an advantage.

Salary scale £485/£545 p.a., Grade 2, N.J.C. conditions.

Appointment of DEMONSTRATOR, BURY DISTRICT. Applicants should be qualified to lecture and advise on the utilisation of electric cookers, washing machines, refrigerators and other domestic appliances, and to give public demonstrations in service centres and at exhibitions.

Preference will be given to applicants who hold the E.A.W. Diploma. If not already held, the successful applicant will be required to obtain such diploma.

Salary scale £400/£490 p.a., Grade 1, N.J.C. conditions.

Applications for the above two posts to the Sub-Area Manager, No. 2 Sub-Area, North Western Electricity Board, National Buildings, St. Mary's Parsonage, Manchester, 3, by 14th August, 1954.

Appointment of FOREMAN, DISTRICT INSTALLATION INSPECTION SECTION, STALYBRIDGE. Applicants must have had good practical experience in testing and inspecting all classes of electrical installations, and they should have a first-class knowledge of statutory and non-statutory regulations obtaining in this class of work. They should have a knowledge of meter fixing and the connecting of all types of meters, together with a good general knowledge of general distribution technique.

Salary £505 p.a., Grade 3, Schedule E, N.J.I.C. conditions.

Applications to the Sub-Area Manager, No. 3 Sub-Area, North Western Electricity Board, Union Street, Oldham, by 14th August, 1954.

Appointment of GENERAL ASSISTANT DISTRICT COMMERCIAL ENGINEER, ROSSENDALE DISTRICT. Applicants should have had experience on industrial and domestic installations, repair and maintenance of appliances and general commercial duties.

Preference given to candidates who possess the H.N.C. in Electrical Engineering.

Salary scale £524/£540 p.a., Grade E.11, N.J.B. conditions.

Applications to Manager, No. 5 Sub-Area, North Western Electricity Board, Jubilee St., Blackburn, by 14th August, 1954.

BRITISH ELECTRICITY AUTHORITY

North West, Merseyside and North Wales Division

VACANCY No. 134/54: ASSISTANT SHIFT CHARGE ENGINEER, Kearsley Generating Station, Salary £766/£796 (K.9).

Vacancy No. 135/54: GENERAL ASSISTANT ENGINEER, Planning & Development Section, Technical Dept. Salary £501/£714 (AX/EX.8). Candidates should preferably hold an engineering degree or H.N.C. Works experience in switchgear and protection an advantage.

Apply, quoting vacancy number, to Controller, British Electricity House, 825, Wilmslow Road, Manchester, 20, before 14th August. 4425

YORKSHIRE ELECTRICITY BOARD

No. 3 (Sheffield) Sub-Area

SHEFFIELD SOUTH DISTRICT

GENERAL ASSISTANT DISTRICT ENGINEER. Applicants must hold at least the Higher National Certificate in Electrical Engineering and should have had experience in construction and maintenance work, and be able to carry out operation duties on 11 kV and L.V. overhead and underground mains in a district containing a heavy industrial and densely developed residential area surrounded by a rural area.

Salary, N.J.B., Class H, Grade 11, £607/£628 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 3 (Sheffield) Sub-Area, Yorkshire Electricity Board, Commercial Street, Sheffield, not later than 19th August, 1954.

No. 1 (Bradford) Sub-Area

SECOND ASSISTANT ENGINEER (Meters, Testing and Protection). Applicants should possess technical qualifications equivalent to those for corporate membership of the Institution of Electrical Engineers, and have such experience as will enable them efficiently to assist with the control of the Sub-Area Meters, Testing and Protection Department with especial concern for fault location on systems operating at various voltages up to 66 kV.

Salary, N.J.B., Class K, Grade 7, £869/£907 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 1 (Bradford) Sub-Area, Yorkshire Electricity Board, 45-53, Sunbridge Road, Bradford, not later than 19th August, 1954.

No. 5 (Wakefield) Sub-Area

SECOND ASSISTANT ENGINEER (Construction). Applicants must be fully experienced in site supervision of all types of direct or remote control substation equipment with ancillary gear up to and including 66 kV and be competent to programme work and deal with correspondence on any technical matters arising therefrom. Experience on industrial, urban and rural systems of both overhead and underground constructions to voltages up to 33 kV is also desirable. Knowledge of supervisory control systems would be an advantage.

Salary, N.J.B., Class K, Grade 7, £869/£907 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 5 (Wakefield) Sub-Area, Yorkshire Electricity Board, 1a, Denby Dale Road, Wakefield, not later than 19th August, 1954.

No. 7 (Grimsby) Sub-Area

SENIOR ASSISTANT (Billing and Rentals). Applicants should have a thorough knowledge of billing procedure in respect of domestic, commercial and industrial consumers, and the maintenance of debtors controls of all types including hire purchase. They should be conversant with punched card methods of billing and have experience in the supervision of staff.

The possession of an accountancy qualification will be an advantage.

Salary, N.J.C., Grade 5, £670/£20/£730 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 7 (Grimsby) Sub-Area, Yorkshire Electricity Board, Moss Road, Grimsby, not later than 19th August, 1954. 4426

SOUTHERN ELECTRICITY BOARD

Draughtsman (Civil Engineering)

NO. 2 (Newbury) Sub-Area. Salary N.J.B. Schedule D, Grade 6 (£433-£567 p.a.). N.J.B. conditions of service.

Applicants should be capable of preparing drawings and making calculations, and have knowledge of building construction, steelwork and reinforced concrete structures.

The successful candidate will be required to contribute to the B.E.A. and Area Boards Superannuation Scheme, if eligible.

Applications on forms obtainable from the Sub-Area Secretary, 7, Oxford Road, Newbury, and returned to him not later than 20th August, 1954. 4403

JOHNSON & PHILLIPS LIMITED

Staff for South Africa

JOHNSON & PHILLIPS Limited require the following Staff for their South African Branch:—

1. CHIEF DRAUGHTSMAN. Candidates must have good technical and practical qualifications, in addition to experience with leading switchgear manufacturers both in design and contract work.
2. SENIOR SWITCHGEAR DRAUGHTSMAN. Candidates must have good technical and practical training, in addition to experience with leading switchgear manufacturers. Some experience in switchgear design is essential.
3. TECHNICAL SALES ENGINEER. Candidates should have a technical background, preferably not less than Higher National Certificate level, and experience in preparing tenders for switchgear up to 33,000 volts.
4. TECHNICAL SALES PROMOTION ENGINEER. Candidates should have a sound technical background, a pleasing personality, and experience of outside representation among buyers and consultants. Successful candidate will operate from Johannesburg, but may be expected to travel in the Northern part of the Union of South Africa, although most of his contacts will be in and around Johannesburg.

These appointments are for permanent situations at the J. & P. Switchgear Works at Driehoek, Johannesburg, where switchgear up to 11,000 volts is manufactured and enquiries for gear up to 66,000 volts are handled. In all cases preference will be given to men between 28 and 38 years of age. Salaries will be in accordance with qualifications and experience, and good bonus and life assurance schemes are in force. Applicants should clearly state for which post they are applying and state age, experience and salary required.

Applications should be addressed to the Employment & Welfare Manager, Johnson & Phillips Ltd., Charlton, London, S.E.7. 4237

YORKSHIRE ELECTRICITY BOARD

No. 3 (Sheffield) Sub-Area

ROTHERHAM/MEXBOROUGH DISTRICT

ASSISTANT CONSUMERS' ENGINEER. Applicants should be Corporate Members of the Institution of Electrical Engineers or hold qualifications leading to such membership, and must have had a sound training with subsequent experience in the work of a consumers' department in an electricity undertaking. Some experience of statistical work would be an advantage.

Details should be given of experience in the following matters: Negotiations with consumers requiring electricity supplies tariffs, sales development, application of I.E.E. wiring regulations and other relevant regulations in testing and inspecting consumers' installations, electrical installation work, including preparation of specifications and tenders, electrical maintenance workshop, control of staff and workpeople.

Salary N.J.B. Class J, Grade 10, £680/£706 per annum.

SHEFFIELD NORTH AND SOUTH DISTRICTS

ASSISTANT INSTALLATION ENGINEERS (Two Posts). Applicants should possess a sound technical training and preferably be Graduate Members of the Institution of Electrical Engineers or possess similar qualifications.

The duties of the post include negotiations with consumers for new and additional supplies of electricity, advice on tariffs and utilization, including power factor correction, specifications, estimates and tenders for all classes of installation work, supervision of installations on site, and control of staff and workpeople.

Salary N.J.B. Class L, Grade 12, £667/£692 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 3 (Sheffield) Sub-Area, Yorkshire Electricity Board, Commercial Street, Sheffield, not later than 12th August, 1954. 4364

SOUTH EASTERN ELECTRICITY BOARD

JOINTERS (Extra High Tension), Worthing District. Wages, 3s. 9d. per hour for 44-hour, 5-day week, under N.J.I.C. Agreement.

Applications, naming 2 referees, to M. J. Mortimer, M.I.E.E., District Manager, Worthing District, SEEBoard, 56, Chapel Rd., Worthing, by 18th August, 1954.

FIRST ASSISTANT DISTRICT ENGINEER, Crawley District. Salary, £675-£701 per annum under N.J.B., Class C, Grade 5. Superannuable. Applicants should be qualified and have experience in the construction, operation and maintenance of overhead and underground systems up to 33 kV. Duties will involve standby.

Applications, naming 2 referees, to F. A. Avery, A.I.E.E., District Manager, SEEBoard, 55, High St., Crawley, Sussex, by 16th August, 1954.

ASSISTANT DISTRICT ENGINEER, Sevenoaks District. Salary, £555 per annum under N.J.B., Class E, Grade 10. Superannuable. Applicants should be suitably qualified and have had training and experience in the construction, operation and maintenance of underground and overhead distribution systems, preferably up to 33 kV. The position will entail standby duties.

Applications, naming 2 referees, to H. F. Gill, District Manager, SEEBoard, Electric House, West Hill, Oxted, Surrey, by 18th August, 1954.

FITTER (Electrical), Worthing District. Wages 3s. 9d. per hour for 44-hour, 5-day week under N.J.I.C. Agreement. Applicants should be experienced in the maintenance, erection, panel wiring, etc., of high-voltage switchgear, transformers and substation ancillary equipment.

Applications, naming 2 referees, to M. J. Mortimer, M.I.E.E., District Manager, Worthing District, SEEBoard, 56, Chapel Rd., Worthing, by 18th August, 1954.

A. L. BURNELL, Secretary.
4429

ARE YOU AN ELECTRICIAN?

IF you are now or have knowledge and previous experience of electrical work you can get

IMMEDIATE EMPLOYMENT

in light engineering work of national importance. These jobs are available in the

SLOUGH AREA

They provide high earning possibilities for the right men and must be filled quickly. It is essential that applicants give fullest details, including age, nature and extent of experience.

Write to—The Employer, Box 4392.

FERRANTI LTD.

invite applications for the following vacancies in their Power Transformer Department:—

(1) ENGINEERS FOR DESIGN AND DEVELOPMENT work in large transformers, voltage regulators and specialised high-voltage equipment. Qualifications include a degree or H.N.C. in electrical engineering and previous design or development experience in power engineering. (Ref. TE.)

(2) DRAUGHTSMEN (ELECTRICAL OR MECHANICAL) with previous experience in power engineering. (Ref. TD.)

Applications are also invited from young graduates completing National Service either for direct employment or for practical works training. (Ref. TG.)

Vacancies also exist for graduate-apprentices wishing to undertake a planned two-year course of training for design, research and development, production or sales, prior to National Service. (Ref. PGA.)

The company operates a staff pension scheme. Application forms from Mr. T. J. Lunt, Staff Manager, Ferranti Ltd., Hollinwood, Lancs. quote appropriate reference. 4377

BRITISH ELECTRICITY AUTHORITY

East Midlands Division

Power Station Superintendent

APPLICATIONS are invited from suitably qualified engineers for the position of Power Station Superintendent at the Derby Generating Station. Candidates for this position should have had considerable experience in the operation and management of a modern generating station and should also have had experience of pulverised fuel firing.

The salary will be in accordance with the National Joint Managerial and Higher Executives Grades Agreement, Scale 1 (£1,150-£1,300 per annum) and the appointment will be pensionable under the British Electricity Authority and Area Boards Superannuation Scheme.

Application forms may be obtained from the Divisional Establishments Officer, British Electricity Authority British Electricity House, P.O. Box 25, Barker Gate, Nottingham, and should be returned to the undersigned by the 18th August, 1954. Please quote Vacancy No. 116/54/ER.

L. F. JEFFREY,
Divisional Controller.
4405

DESIGN ENGINEERS

THE ENGLISH ELECTRIC CO. LTD. invite applications for the following positions in their Mechanical Engineering Department at Luton:—

SENIOR DESIGN ENGINEERS. Age 28-35. Minimum qualifications H.N.C. standard with sound engineering training and experience. Applicants must be capable of initiating original designs, and some supervisory experience would be an advantage but not essential.

JUNIOR DESIGN ENGINEERS. Age 24-38. O.N.C. standard, to work in conjunction with Senior Engineers developing designs to a fully completed stage. A sound knowledge of workshop practice is desirable.

All positions require a thorough drawing office background in light/medium mechanical or electro-mechanical engineering. Successful applicants would be engaged on the original design of a wide variety of laboratory equipment, test rigs and specialised machines. Good salaries and conditions for the right men. Apply to Dept. C.P.S., 336/7, Strand, London, W.C.2, quoting ref. 1261A. 4341

BRITISH ELECTRICITY AUTHORITY

South Eastern Division

APPLICATIONS are invited for the position of THIRD ASSISTANT ENGINEER (Operation) at Divisional Headquarters, Kingston. Applicants should have a good electrical and mechanical engineering background, together with a sound knowledge of operation of modern power station plant.

The successful applicant, who must have ambition and the ability to work effectively as a member of a team, will be engaged on work that requires an active analytical and enquiring mind. Membership of either the Institution of Mechanical or Electrical Engineers will be an advantage.

Class AX, Grade 5, commencing at £681 9s. p.a., including London allowance.

Applications, giving details of education, present position, experience, etc., should be received by the Establishments Officer, British Electricity House, Lower Ham Road, Kingston-upon-Thames, by 13th August, 1954. 4381

SOUTH WALES ELECTRICITY BOARD

REQUIRED, 2 ENGINEERING DRAUGHTSMEN in the Central Sub-Area at Cardiff. Salary Grade 6, Schedule D (£433/£567) of N.J.B. Schedule.

Applications, stating age, present position and salary, qualifications, experience and three referees, to be addressed to the Secretary to arrive by 7th August, 1954.

St. Mellons, D. G. DODDS,
Cardiff. Secretary. 4369

NORTH WESTERN GAS BOARD

Manchester Group

Electrical Superintendent, Bradford Road Works, Manchester

APPLICATIONS are invited for the above pensionable appointment at a salary within Grade A.P.T. 12 (£765-£890 per annum).

Applicants should preferably be Corporate Members of the Institution of Electrical Engineers or have passed sections A and B, or be exempt therefrom. They should have experience in the operation and maintenance of 2,500-kW, 6.6-kV alternators, 6.6-kV and 440-v. distribution systems, electric motors and starters up to 500 h.p. at 6.6 kV, and the organisation of routine electrical maintenance on large gasworks and coke oven plants.

Detailed applications, giving the names of two referees, should reach the General Manager, North Western Gas Board (Manchester Group), Town Hall, Manchester, 2, within 14 days. 4411

BRITISH ELECTRICITY AUTHORITY

South West Scotland Division

Assistant Shift Charge Engineer, Kilmarnock

APPLICATIONS are invited for the position of Assistant Shift Charge Engineer at Kilmarnock Power Station.

The post will be superannuable and the salary in accordance with Class F, Grade 9, of the National Joint Board Agreement, commencing rate £607 per year. Applicants should have attained the Higher National Certificate in Electrical or Mechanical Engineering and have had power station control room experience.

Applications on Form AE.6, which may be obtained from the Divisional Office of the Authority, should be forwarded to the Divisional Secretary, 168, Broomhill Drive, Glasgow, W.1, before Monday, 16th August, 1954. 4408

BRITISH ELECTRICITY AUTHORITY

South Eastern Division

ASSISTANT SHIFT CHARGE ENGINEER, Littlebrook Power Station. Applicants should possess technical qualifications equivalent to Graduate Membership of either the Institution of Mechanical or Electrical Engineers.

Experience in the efficient operation of modern high-pressure power station plant with P.F. firing and experience in administration and control of labour essential. Assistance with housing may be possible for those living at present in rented property.

Class M, Grade 9, £906 3s. per annum.

Applications, giving details of education, present position, experience, etc., should be received by the Station Superintendent, Littlebrook Power Station, Near Dartford, Kent, by the 13th August, 1954. 4391

SURREY COUNTY COUNCIL

APPLICATIONS are invited for the appointment of ASSISTANT ELECTRICAL ENGINEER, Grade VII, salary £735 × £25 to £180 p.a., plus London Weighting. Applicants should be Corporate Members of Inst. Elec. Engineers and experienced in preparation of schemes, specifications, drawings and estimates for, and supervision of, installations of electrical services in large buildings.

Applications, giving full details and present salary, accompanied by copies of three recent testimonials, to the County Architect, County Hall, Kingston-upon-Thames, not later than 14th August, 1954. 4418

SOUTH WALES ELECTRICITY BOARD

REQUIRED, ASSISTANT ENGINEER (Mains) in District 462 (Newport) in the Eastern Sub-Area.

Salary Class F, Grade 10 (£577/£588/£598) of N.J.B. Schedule.

Applications, stating age, present position and salary, qualifications, experience and three referees, to be addressed to the Secretary to arrive by 7th August, 1954.

St. Mellons, D. G. DODDS,
Cardiff. Secretary. 4370

BRITISH ELECTRICITY AUTHORITY

North West, Merseyside and North Wales Division

APPLICATIONS are invited for the appointment of SHIFT CHARGE ENGINEER at the Connah's Quay Power Station, Connah's Quay, North Wales. Salary £729/£758 per annum, Grade 7, Class G, N.J.B. Superannuable and subject to medical examination.

Applicants should preferably be Associate Members of the Institution of Electrical or Mechanical Engineers or possess equivalent technical qualifications, have had a good general and technical education, and be experienced in the shift operation of a modern power station.

Application forms may be obtained from the Divisional Controller, Beaconsfield Road, Woolton, Liverpool. Closing date 18th August, 1954. 4407

BRITISH ELECTRICITY AUTHORITY

South East Scotland Division

GENERAL ASSISTANT ENGINEER required in the Protective Gear and General Section of the Technical Department at Divisional Headquarters, Portobello.

Applicants should possess qualifications leading to Associate Membership of the I.E.E., and have experience in the design, manufacture and commissioning of switchgear and protective gear. Knowledge of transformers and alternators an advantage.

Salary scale £501-£656 per annum (N.J.B. Class AX/BX/8). Placing according to experience. Pension scheme.

Apply in writing by 14th August, 1954, to the Divisional Controller, British Electricity Authority, South East Scotland Division, British Electricity House, Portobello, Midlothian. 4378

SENIOR ENGINEER

M.T.E. CONTROL GEAR LIMITED require a Senior Engineer to take charge of the Engineering Department and Drawing Office. Applicants must have had considerable experience in the automatic control gear field (A.C. and D.C.), especially circuit work, component and enclosure design. Administrative experience is also essential.

The person appointed will be entirely responsible for all matters connected with the Drawing Office and Engineering sections, and will work directly under the Technical Director.

Please apply in writing, stating (1) training, (2) experience up to date, (3) commencing salary expected, and (4) age.

M.T.E. CONTROL GEAR LIMITED
Leigh-on-Sea, Essex

4320

BRITISH RAILWAYS

Southern Region

ELECTRICAL ENGINEERING TECHNICAL ASSISTANTS are required for work connected with Electric Rolling Stock. General workshop experience an advantage. Applicants should not be more than 30 years of age and have a sound technical training, having reached Higher National Certificate in Electrical Engineering standard, or equivalent.

Commencing salary £350 p.a. at age 22 rising to £521 10s. p.a. at age 30. Applicants holding certain academic qualifications may receive up to £75 p.a. in excess of these rates.

Applications in writing to be addressed to Mechanical & Electrical Engineer, 15, St. Thomas St., London Bridge, London, S.E.1. 4374

PRODUCTION MANAGER

M.T.E. CONTROL GEAR LTD. require fully experienced PRODUCTION MANAGER. Must be completely conversant with machine shop and control gear assembly practice. Immediate managerial status and excellent future opportunities. Apply giving full details of previous experience to:—

M.T.E. CONTROL GEAR LIMITED
London Road, Leigh-on-Sea
Essex

4388

TRANSFORMER DESIGNERS

Bruce Peebles & Co. Ltd., Engineers, Edinburgh, 5

invite applications for the following positions:—

CHIEF DESIGNER in charge of the Transformer Design Department and fully responsible for design of transformers of all sizes up to 150 MVA at voltages up to 275 kV. This is an important and attractive position with full scope for initiative. A commensurate salary will be paid to a man of proved ability.

ASSISTANT DESIGNER experienced in design of distribution and medium-size power transformers. Salary commensurate with experience.

Applications with full details to Mr. R. W. Fox, Manager, Transformer Department, at above address. 4376

BRITISH ELECTRICITY AUTHORITY

South Wales Division

Vacancy No. 79/54

APPLICATIONS invited for superannuable N.J.B. appointment of FIRST ASSISTANT STATION CHEMIST, Cardiff Power Station. Salary F.9, £607-£629 per annum.

Degree in chemistry or equivalent, and experience in water treatment, coal and oil testing and corrosion problems desirable.

Application forms obtainable from Secretary, South Wales Division, British Electricity Authority, Twyn-y-fedwen Rd., Gabalfa, Cardiff, to be returned by 16th August, 1954. 4415

SOUTH WALES ELECTRICITY BOARD

REQUIRED, COMMERCIAL ASSISTANT, District 342 (Merthyr) in the Central Sub-Area.

Applicants must have had experience in the application of electricity to commercial and domestic premises and all general purposes.

Salary Class E, Grade 13 (£447/£453/£460) of N.J.B. Schedule.

Applications, stating age, present position and salary, qualifications, experience and three referees, to be addressed to the Secretary to arrive by 7th August, 1954.

St. Mellons, D. G. DODDS,
Cardiff. Secretary. 4368

ELECTRICAL ENGINEER

A WELL-known old-established switchgear company requires a professional ELECTRICAL ENGINEER, age 30/35, to negotiate sales through consulting engineers and others in Lancashire and Yorkshire.

It is essential that applicants have had a regular electrical training, first-class selling experience, and be competent to obtain and conduct high-level interviews. It is desirable that they be members of the I.E.E.

Commencing salary to successful applicant, who must be a car owner, £1,000 per annum, plus expenses and commission.—Box 4366.

RICHMOND MAIN SEWERAGE BOARD

ENGINEERS required for rotary shifts; salary £590. Responsible operation works plant, including 330-kW diesel alternators, pumps, compressors. Applications to the Board, West Hall Road, Kew Gardens, Surrey. 4389

ALKALINE BATTERIES Ltd., of Redditch, are the largest makers in the Empire of alkaline accumulators, miners' lamps and emergency lighting systems, which are in rapidly growing use particularly for export. The company has vacancies in its technical sales and development sections for graduate electrical engineers, not over 30 years of age, or for men nearing the end of their degree course who have completed National Service. The posts are pensionable and offer the prospect of executive rank. Applications with full educational details and experience should be addressed —Commercial Manager, Alkaline Batteries Ltd., Union Street, Redditch. 3936

ASSISTANT to transformer designer required, preferably with knowledge of protective current transformer design. Please give details of experience, age and salary required to—The Personnel Manager, Ferguson Pailin Ltd., Buckley Street, Higher Openshaw, Manchester, 11. 4313

AGENTS required throughout the British Isles for the sale of conduit fittings and allied products. Apply—Box 4340.

APPLICATIONS are invited by progressive London electrical contractors for position of installation engineer. Applicants must have experience in preparation of specifications and estimates, supervision on site of industrial and other installations. Excellent prospects. Superannuation scheme. Salary commensurate with experience and ability. Write giving full details qualifications, experience, age and salary required.—Wm. Steward & Co. Ltd., 154, Albany Street, London, N.W.1. 7541

ASSISTANT chief engineer required by company engaged in the design and development of guided weapons. Candidates must be mechanical engineers with first-class qualifications and experience in electronics and light engineering. Knowledge and experience in servo-mechanisms essential since duties would include responsibility for missile control systems, electrical gyros, accelerometers, etc. Applicants should be 30-35 years of age and have sufficient personality and experience to administer and organise the development activity on these subjects. Write in detail, quoting reference G, to—Box AC.91032, Samson Clarks, 57/61, Mortimer Street, London, W.1. 123

CEYLON European-controlled company seeks electrical engineer with minimum qualifications Higher National Certificate, preferably unmarried, sound practical knowledge of A.C. and D.C. distribution, alternator and generator installation and maintenance. Estimating and sales experience an advantage. Salary approximately £90 per month, provident fund, medical and other benefits. Write — Box ZC.312, Deacon's Advertising, 36, Leadenhall Street, London, E.C.3. 4318

CHEMIST (male or female), with some knowledge of bacteriology, biochemistry or the chemistry of soils or sewage, to study the effects on rivers of power station operations, required by the British Electricity Authority at London Headquarters. The appointment will be based on London, but the work involves travelling to power station sites anywhere in the country. Salary N.J.B. Grade 5, £558-£769 p.a. inclusive. Forms from D. Moffat, Director of Establishments, British Electricity Authority, Winsley Street, London, W.1, to be returned by 28th August. Quote ref. ER/499. 4428

CONSULTING engineers require electrical designer-draughtsman, age twenty-four to thirty-five; experienced in all classes of lighting and power installations for hospitals, schools, industrial projects; preparation of contract and specifications, etc. Good draughtsmanship essential. Reply to—A. F. Myers & Partners, 147, Victoria Street, London, S.W.1. 4386

CONTROL gear agents required with established connections for the sale of a unique and outstanding range. Write, stating experience and area covered, to—Box 4339.

COSTING clerk required, electrical and radio distributors, S.W.1 area. Superannuation, 5-day week. Apply by letter, stating experience and salary required, to—Branch Manager.—Box 4413.

CROMPTON PARKINSON Limited have a vacancy for a graduate in engineering who has completed his compulsory military service and needs practical training to help fit him for works and sales executive post. Applications to—MD/P(G), Crompton Parkinson Limited, Crompton House, Aldwych, London W.C.2. 4379

CROMPTON PARKINSON Limited invite applications for posts as instrument salesmen. Applicants should be engineers with sound knowledge of the electrical industry, and preference will be given to those with experience in the instrument side of the industry. A period of training will be given to successful applicants. Excellent conditions, superannuation scheme and other amenities. Applications in full detail should be addressed to—Ref. MD/P(J), Crompton Parkinson Ltd., Crompton House, Aldwych, London W.C.2. 4419

DESIGNER required for work on medium and high-voltage power factor correction and furnace capacitors. Must have degree or H.N.C. or the equivalent in electrical engineering, and experience in the design and manufacture of medium/heavy electrical equipment. Good prospects. Write, giving full details of qualifications, age and salary required, to—The Technical Director, A. H. Hunt (Capacitors) Ltd., Bendon Valley, London, S.W.18. 71

DESIGN draughtsman. A vacancy exists in our design drawing office for a first-class designer draughtsman for interesting work associated with the development of automobile electrical equipment. He should be at least of H.N.C. standard and experience in the design of light electrical equipment for large quantity production would be an advantage. The post provides excellent scope for initiative and advancement. Reply stating qualifications, experience and age, to—Personnel Manager, Joseph Lucas Ltd., Great King Street, Birmingham, quoting reference PM/D/93. 143

DESIGN draughtsman required for M.V. and and E.H.V. switchgear; H.N.C. or equivalent. Salary commensurate with qualifications. Pension scheme. Works in country situation, 20 miles London. Accommodation can be arranged. Apply—Chief Engineer, J. G. Statter & Co. Ltd., Amersham Common, Bucks, marked "Confidential." 4373

DRAUGHTSMAN, electrical, senior or intermediate, with experience in electrical circuits for automatic controls, required by engineers in West London area. Should have some knowledge of power circuits and be interested in development work, including electronic application. 5-day, 37½-hour week, and pension scheme. Salary according to experience and qualications.—Box 4414.

DRAUGHTSMAN required for design and detail work on electrical/mechanical apparatus. Should be at least of H.N.C. standard. Workshop experience essential. Apply in writing to — Personnel Manager, A. H. Hunt (Capacitors) Ltd., Bendon Valley, Garratt Lane, London, S.W.18. 41

DRAUGHTSMEN. Previous experience in motor control equipment circuit work helpful but not essential if applicants are up to O.N.C. standard. Good salary and prospects. For successful applicants requiring housing accommodation, assistance may be given for skilled and key personnel. Pension scheme; 5-day week; canteen. Details of age, experience, qualifications and commencing salary to —Personnel Officer, Dewhurst & Partner Ltd., Inverness Road, Hounslow, Middlesex. 4200

ELECTRICAL draughtsman required by firm of consulting engineers for work on lighting and power installations for all classes of building. Applicants should have practical experience and should be capable of preparing specifications under supervision. Qualifications O.N.C. minimum. Write stating qualifications, experience, age and salary required to—J. Roger Preston & Partners, 15, North Audley Street, London, W.1. 4421

ELECTRICAL draughtsman required for control gear circuit diagrams. Lift experience preferable but not essential. Write stating age, qualifications and salary expected to—J. & E. Hill Ltd., Lift & Escalator Department, Dartford. 4250

ELECTRICAL draughtsmen, two senior. Higher National Certificate standard. Apply to—Chief Engineer, The Bowater Paper Corporation Limited, Northfleet, Kent. 4375

ELECTRICAL engineer wanted (aged 30-40, preferably chartered) to assume leading position, commanding equivalent £1,000 p.a. to start, in design office of London company manufacturing automatic precision machinery. Previous drawing office and industrial experience of control gear and mechanisms essential.—Box 4202.

ELECTRICAL engineer-surveyor required, based on London but for duties as relief surveyor in any part of the country. Suitable for single man only. Minimum qualifications H.N.C. Maximum age 32. Industrial experience a recommendation. Salary scale commencing £540 rising to £785 over ten years. Non-contributory pension scheme and other emoluments. Apply — Manager, Engineering Dept., General Accident Assurance Corpn., 99, Aldwych, London, W.C.2. 4326

ELECTRICAL fitter required. Applicants should have outside erection experience on H.V. switchgear and transformers. Wages at present 3s. 9d. per hour, N.J.I.C. conditions. Apply in writing to—Mr. H. A. P. Caddell, Sub-Area Manager, Midlands Electricity Board, 31, Kingsway, Stoke-on-Trent. 4380

ESTIMATING (sales) clerk (male), age 21/30, required. Good standard in maths. and general education essential. Progressive, superannuation, sports. Permanency for right man. Apply—Personnel Officer, Southern United Telephone Cables Ltd., Dagenham Dock. 4352

ELECTRONIC engineer required by capacitor manufacturers (East London) for development work on test instruments and electrical research. Opportunity for young engineer with some years' experience.—Box 4225.

ENGINEER required for the development of a wide range of fractional horse-power motors. Experience of this work and H.N.C. (Elect.) or equivalent essential. Salary approximately £700 to start. Candidates, aged 25-35, should apply in writing stating age, education, qualifications and experience to—The Employment Office, Hoover Ltd., Perivale, Middx. 4382

ENGINEER/draughtsman required by South Lancashire firm manufacturing special purpose machines. Applicants should be at least O.N.C. standard and have some drafting experience of control circuits, etc. Reply stating age, qualifications, experience, salary required, to—Box 4280.

ESTIMATOR required, accustomed to measuring P.A.X. and intercomm. telephone installations. Reply giving full particulars and salary required to—Box 4385.

EXPERIENCED surveyor used to overhead transmission lines, to work from Edinburgh office.—Box 1930, Robertson & Scott, 42, Charlotte Square, Edinburgh, 2. 4371

HIGHLY skilled electrician required for small contractors. Excellent prospects for advancement. Single men preferred.—Box 4348.

ILLUMINATING engineer with several years' practical experience required; preference given to applicants with Higher National Certificate in Electrical Engineering. Apply—Chief Illuminating Engineer, Metropolitan-Vickers Electrical Co. Ltd., 1/3, St. Paul's Churchyard, London, E.C.4. 4319

IMPERIAL CHEMICAL INDUSTRIES Ltd., Metals Division, has a vacancy at its Witton works for a senior design draughtsman (electrical) with experience of layout of industrial power distribution, automatic control gear and substation design. Salary up to a maximum of £890 p.a., according to qualifications and experience. Application forms may be obtained from — Assistant Staff Manager, I.C.I. Metals Division, Kynoch Works, Witton, Birmingham, 6. 4372

JOINTER/plumber/cable, first-class high tension, required for 12 months' service overseas by large firm electrical engineers. Write fully age, experience.—Box 4227.

JOSEPH LUCAS Ltd. have vacancies in their design drawing office for several first-class mechanical designers for work on small motors and switchgear. Applicants should be up to H.N.C. standard and it is desirable that they should have experience in designing for quantity production. The positions are permanent and pensionable and offer excellent opportunities to men possessing initiative and originality. Please reply, stating experience, qualifications and age, to — Personnel Manager, Joseph Lucas Ltd., Great King Street, Birmingham. 142

JUNIOR draughtsmen required by manufacturers of medium voltage switchgear; 5-day week and superannuation scheme. State age, technical qualifications and salary required to —Ottermill Switchgear Ltd., Ottery St. Mary, Devon. 4226

JUNIOR engineer for transformer sales and estimating department. Some experience transformers advisable but not essential. Outer London area.—Box 4214.

KEEN young sales engineer required as Midlands representative by manufacturers of all forms industrial m.v. switchboards, cubicles, control panels, substation switchboards, feeder pillars, etc., with full range heavy duty combination fused switches to 800 amps. and full industrial and domestic range of fusegear. Give details of experience in confidence to—Managing Director, Dennis Switchgear, Fleming Road, Speke, Liverpool. 4422

LARGE European-controlled company in Ceylon requires assistant electrical engineer, age 20/30 years, preferably unmarried, sound knowledge of A.C. and D.C. distribution and work covered by general electrical contractors. Attractive terms to right man. Write—Box ZD.313, Deacon's Advertising, 36, Leadenhall Street, London, E.C.3. 4317

MAINTENANCE electricians required for steel works plant in Cardiff. Knowledge of automatic control gear for A.C. and D.C. motors essential. Must be members of E.T.U. Day work on 44-hour week but prepared to work shifts on 48-hour week.—Box 4243.

MANAGER for electrical installation department. Must be capable of designing, estimating and supervising all types of installation. Please give details of experience and salary required.—Simpson Brothers (of Hapton) Ltd., Hapton, Burnley. 4384

MANCHESTER firm of contractors require working foreman used to erecting concrete and steel columns for road lighting and capable of controlling workmen. Must be willing to travel. High salary and generous expenses. Only men with experience and organising ability need apply.—Box 4394.

MECHANICAL engineer with good technical qualifications required for 80-MW industrial power station. Age not less than 30. Commencing salary £950 to £1,100, with generous non-contributory pension scheme. Up-to-date and responsible power station experience essential. Apply in writing to—Salaried Personnel Department, Ford Motor Company Limited, Dagenham, Essex, quoting ref. PHE. 4424

MOTOR winding foreman required by West London firm. Progressive permanent post for fully experienced man able to carry out without supervision rewinds, repairs, etc., all types motors, fractional to 10 h.p., A.C. and D.C.—Box 7538.

NEON glass benders for employment in London, Southampton, Leicester, Newcastle-on-Tyne. Write—Pearce Signs Ltd., New Cross, London, S.E.14. 4417

NON-ring electric lamp manufacturers, London area, require a works manager for their miniature lamp production. Only applicants with full practical experience will be considered. Salary in the region of £2,000 p.a., plus bonus.—Box 4353.

OVERHEAD linesman, first-class high tension, required for 12 months' service overseas by large firm electrical engineers. Write age, experience.—Box 4228.

PIRELLI-GENERAL CABLE WORKS Ltd., have sales department staff vacancies for general correspondence and preparation of mains cable tenders. Apply in writing to Paper Cable Sales Department, Leigh Road, Eastleigh, Hants. 4277

POWER station attendant required for heavy industrial plant in Cardiff. Applicants should have maintenance experience on large electrical machines and preferably a knowledge of H.T. distribution systems. Must be member of E.T.U. Day work on 44-hour week but prepared to work shifts on 48-hour week.—Box 4244

PRODUCTION manager. Managing director important engineering company producing electric domestic appliances wishes to interview production engineer in early thirties, preferably unmarried, to train as production manager with a view to taking over technical management of a subsidiary plant in S.E. Europe. Reply should give details of experience to—Box 4412.

REPRESENTATIVE required by leading manufacturers of contemporary lighting fittings to cover London electrical contractors and wholesalers. Good prospects on salary basis offered in newly formed division to keen young man with real ability who is prepared to work hard. Give full particulars of previous posts and salaries to — Sales Manager, The Merchant Adventurers Ltd., 43, Portland Rd., London, W.11. 4400

REPRESENTATIVES required by manufacturer of diesel and petrol engine-driven generator sets, welding sets, water pumping sets and air compressor sets. Applicants should have their own offices and sales staff for the following areas: South Wales, North Wales and North-West and Eastern counties.—Box 4297.

TECHNICAL assistants for experimental and test dept. of long-established manufacturer, London, engaged on meter and other light engineering work. Technical training to at least O.N.C. standard is necessary. Attractive and progressive staff posts, pension scheme. State education, experience and present salary. Box 4427.

THE ENGLISH ELECTRIC VALVE Co. Ltd., Chelmsford, have vacancies for young engineers to work on radio valve design and development. Applicants should be of degree standard. Whilst experience of this type of work is desirable, it is not essential, and otherwise suitable candidates will be considered. Write, giving full details, quoting Ref. 497F, to — Central Personnel Services, The English Electric Co. Ltd., 336/7, Strand, London, W.C.2. 4393

SALES engineer required for London and Home Counties. Candidates must have experience of electric motors and their applications, and should preferably hold the Higher National Certificate. Good opportunity for young energetic engineer. Write giving full particulars to—Personnel Manager, Small Electric Motors Ltd., Churchfields Rd., Beckenham, Kent. 4359

SALES manager required by electrical engineering company. Position involves complete control of all sales staff and demands a keen approach to sales technique and organisation. Qualifications sought are a record of achievement in a competitive market; technical background; plus knowledge of the application of electrical measuring instruments and/or electronic apparatus. The company offers a permanent position with pension scheme. Write, in strictest confidence, with details, stating salary expected, to—J. P. Steward, Measuring Instruments (Pullin) Ltd., Acton, London, W.3. 4360

SENIOR technical estimator required. Must be technically conversant with multi-motor contactor type control equipment and auxiliary items. Position is a senior appointment and the successful applicant must have a good knowledgeable background of control equipment and its technical applications, etc. Assistance towards housing accommodation may be given if required. Pension scheme, 5-day week, canteen, etc. Please state age and salary required, together with details of experience obtained.—Personnel Officer, Dewhurst & Partner Ltd., Inverness Rd., Hounslow, Middx. 4383

SENIOR lady demonstrator, age 35/45, required by the Parkinson Stove Co. Ltd. Applicant must be competent to discuss the company's appliances with customers at the highest level and must possess recognised qualifications in domestic science, plus wide experience in cookery demonstration. A knowledge of laundry work would also be an advantage, as would experience of training personnel for demonstration work. The salary offered will depend on qualifications and experience, but an indication of salary required should be included in the letter of application, together with age, details of qualifications, experience, etc. Letters, in full confidence, to—Personnel Manager, Parkinson Stove Co. Ltd., Iron Lane, Stechford, Birmingham, 33. 4398

THE Engineering Division of The Distillers Company Limited have vacancies in their London office for senior and junior electrical draughtsmen for power and lighting layouts, with a knowledge of flameproof installation and equipment for industrial and chemical plants. Replies giving fullest details of experience, technical qualifications, age and salary required should be addressed to — The Appointments Secretary, The Distillers Company Limited, Engineering Division, Southern Office, Devonshire House, Piccadilly, London, W.1. 4309

TRANSFORMER engineer required for sales and estimating department. Must be capable of handling tenders for transformers up to 20,000 kVA. Outer London area.—Box 4213.

TRANSFORMER test engineer, senior or junior, with experience up to 10,000 kVA, 66 kV. Minimum technical qualification Ordinary National Certificate. Progressive position. Pension scheme. Apply — Brentford Transformers Ltd., Kidbrooke Park Road, London, S.E.3. 4315

WAR OFFICE require technical assistant, grade I, general engineering (electric) at Vehicle Armament and Plant Branch, Electrical and Mechanical Wing, R.E.M.E., Arborfield, Berks, to investigate maintenance and repair problems on electrical power equipment and to write reports and handbooks. Applicants must have served apprenticeship and possess H.N.C. in electrical engineering, have sound technical knowledge and considerable experience of (preferably Army) electrical power equipment, be capable of collating technical information from various sources and writing technical literature quickly, clearly and accurately. Previous experience in writing technical handbooks desirable but not essential. Salary range £742 to £910, starting salary fixed according to age, qualifications and experience. Annual increases are payable subject to satisfactory service. Application forms from — M.L.N.S., Technical and Scientific Register (K), Almack House, 26, King Street, London, S.W.1, quoting D.400/54A. Closing date 28th Aug., 1954. 4361

THE ENGLISH ELECTRIC Company Ltd. requires young man capable of preparing rough layouts for technical sales literature and negotiating its production through all stages. Apply, giving full particulars of age, experience and salary expected, to — Assistant Publicity Manager, The English Electric Company Ltd., Foregate Street Offices, Stafford, quoting ref. 1355A. 4311

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A.C. and D.C. motors, generators, from stock.—Service Electric Co. Ltd., Honeypot Lane, Stanmore, Middx. (Edgware 5566/9). 91

ALTERNATOR control panel cubicles, 1,000 kW, 500 kW, 250 kW, 150 kW, 3-phase, 440 volts.—Britannia Manufacturing Co. Ltd., 22/26, Britannia Walk, London, N.1. 31

ALTERNATOR, steam compound, Belliss & Morcom, 140 kVA, 3-phase and neutral, 428 r.p.m., 400/50 volts; also alternator, 12 kW, and transformer, 1,500 r.p.m., 230 volts. Apply—The Saw Mills Co. Ltd., Bow Bridge, Stratford, London, E.15. 4397

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DIESEL generating sets, English manufacture, 3-phase, all sizes to 500 kW.—Britannia Manufacturing Co. Ltd., 22-26, Britannia Walk, London, N.1. 16

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FRACTIONAL h.p. motors, new, ex stock, A.C./D.C., Universal, B.T.H., Delco-Remy, G.E.C., Fracmo, Newman, Scophony.—Jeary Electrical Co. Ltd., 5, Lamb's Buildings, London, E.C.1. 38

GENERATING sets, petrol and diesel-driven, up to 30 kVA, new and reconditioned. Plants built to special requirements; consult us without obligation.—Powerco Ltd., Wandsworth Town Stn., York Rd., London, S.W.18 (VANdyke 5234). 153

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MERCURY switches are made by Hall, Drysdale & Co. Ltd., of 58, Commerce Road, Wood Green, London, N.22 (Tel. Bow 7221). 182

METROPOLITAN-Vickers variable speed, 400-volts, 3-phase, 50-cycles commutator motor, 20/20 h.p., 1,200/600 r.p.m., fitted with pilot motor operated brush gear.—Whitefield Machinery & Plant Limited, Cobden Street, Salford, 6 (Tel.: Pen. 1373/4746). 4289

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COMPANY MEETING

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Considerably Increased Output and Deliveries

THE Forty-Eighth Annual General Meeting of Hackbridge and Hewittic Electric Company Ltd. was held on 26th July at the office of the Registrars, Anglo-Scottish Amalgamated Corporation Ltd., Hasilwood House, 68 Bishopsgate, London, E.C.2. Mr. Douglass Hewitt presided.

Before proceeding with the business of the meeting, Mr. Douglass Hewitt referred to the great loss sustained by the Board, shareholders and employees in the death on the 13th July of the Chairman, Mr. T. F. Lister, who had been associated with the company for 29 years. The present strength and success of the company was due, in no small measure, to the untiring and devoted efforts of Mr. Lister.

Late Chairman's Statement

The following is an extract from the statement by the late Chairman which had been circulated with the report and accounts for the year ended 31st March, 1954:—

The trading profits of the Group amount to £501,000, an increase of £44,000 over the previous year, which reflects a considerable increase in output and deliveries during the year.

In order to meet the demands for higher voltage transformers, and to facilitate and improve the methods and conditions of manufacture, it was decided to extend the main transformer assembly bays and test equipment. It is hoped to have this extension available for use within a few months thereby putting the company in a position to quote much earlier delivery dates for transformers of the largest capacity and highest operating voltages. This tendency towards larger units applied to the Rectifier Division as well as to the Transformer Division, and during the past twelve months the two largest rectifier installations made by this company were commissioned in the U.S.A. These are the largest glass bulb unit installations in the world. Other large rectifier installations put into service during this period were eight substations for the British Railways Southern Region (out of a total of 28 on order) and a particularly interesting change-over scheme at Bond Street for London Transport, which is to be followed by a similar but larger installation at Charing Cross.

The order book of the company is satisfactory and ensures full output in all divisions during the coming year. Incoming orders, however, show a decline over previous years which may well affect output during the following year unless there is a change for the better in this respect in the near future.

Profit and Allocations

After providing for all outgoings and taxation, the net profit of the Group for last year amounts to £167,700. The Directors have transferred to General Reserve the sum of £75,000 and they recommend the payment of a final Ordinary dividend of 20%, making with the 5% interim dividend already paid a total of 25%, less tax, for the year, compared with 20% paid for the previous year.

The dividend expressed as 25% on the Ordinary stock is, in effect, actually only 10.7% on the real capital employed, and it is in this light that the rate of dividend should be considered. We are pleased to record, too, that our employees have benefited by the increased output and profits to the extent of a sum totalling £120,000, which represents an increase of 24% over normal wages and salaries. This payment to employees has been made in the form of output bonus, long-service bonus, provisions for pensions, canteen services and holidays-with-pay.

The Consolidated Balance Sheet shows that the capital, reserves and undistributed profits of the Group amount to £1,518,000, an increase of £90,000.

The report and accounts were adopted. 4358

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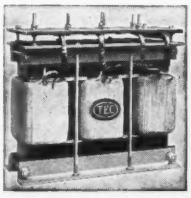

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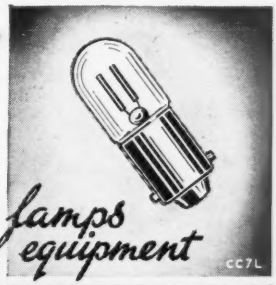

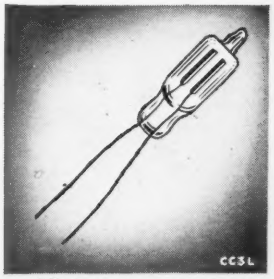

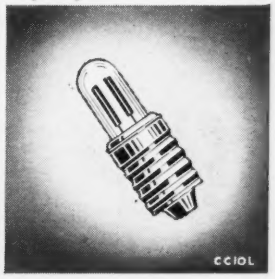

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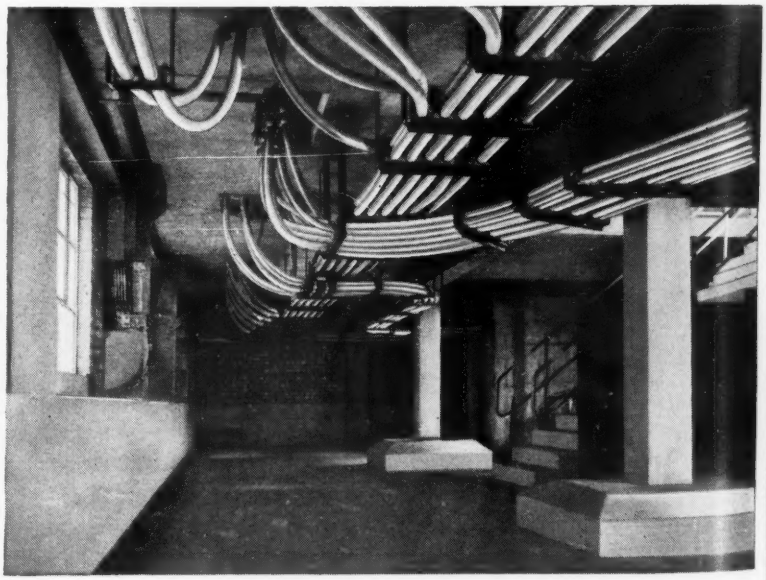

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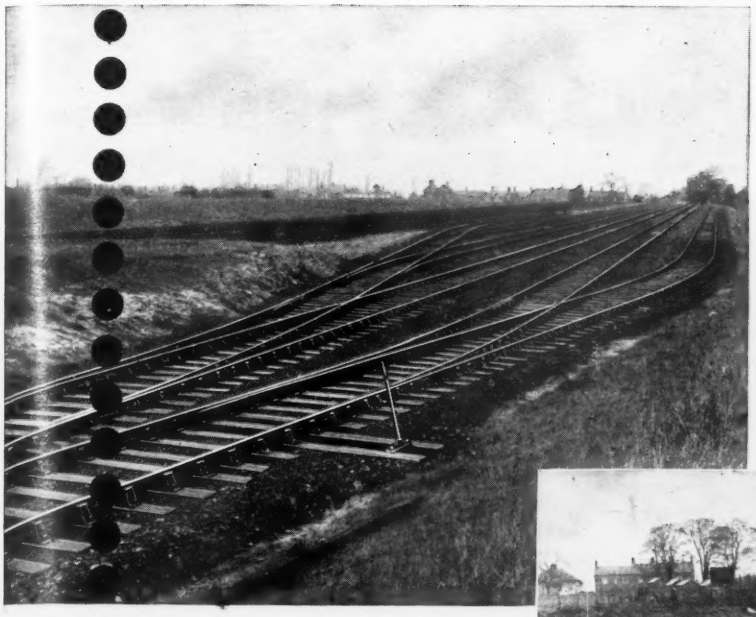

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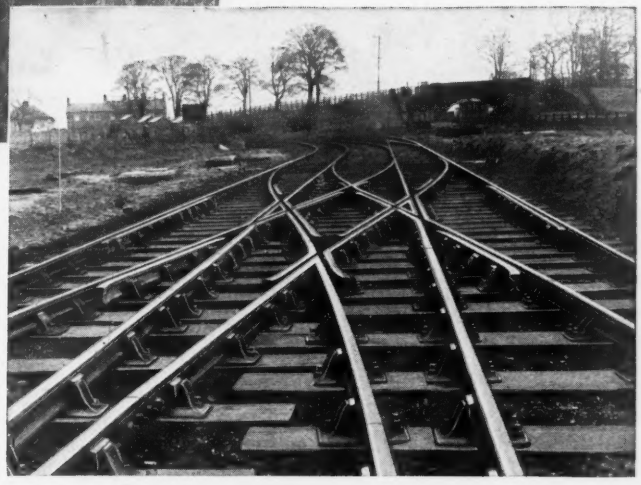

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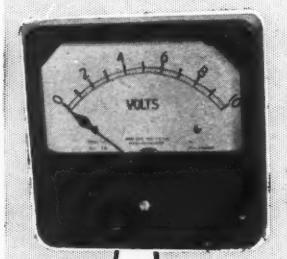

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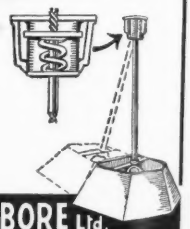

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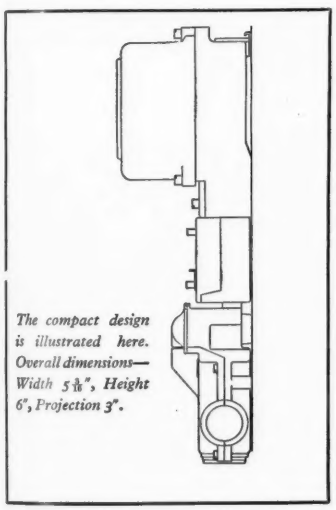

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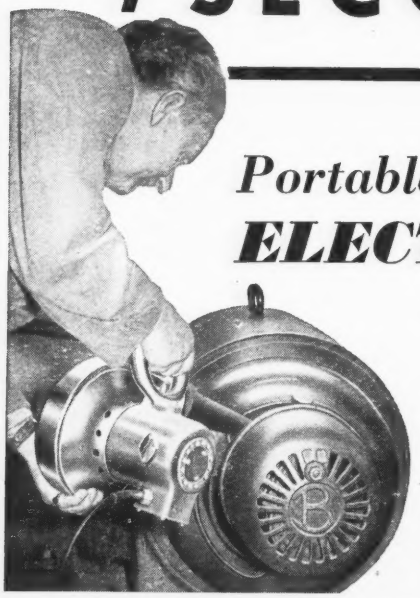

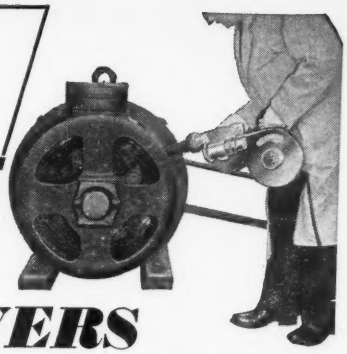

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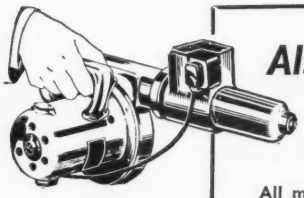

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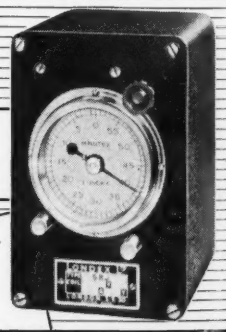

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